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DEPARTMENT OF THE ARMY FIELD MANUAL

PATHFINDER OPERATIONS

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HEADQUARTERS, DEPARTMENT OF THE ARMY
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No. 57-38 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 28 March 1966

PATHFINDER OPERATIONS

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*This manual supersedes FM 57-38, 21 October 1963.

CHAPTER 1

INTRODUCTION

1. Purpose and Scope

a. This manual is a guide for commanders and staffs of ground and aviation units in organizing, training, and employing pathfinder detachments to furnish navigational assistance to Army aircraft. The manual outlines the procedures employed by pathfinder detachments during various types of operations, to include organization, planning, preparation, and execution of missions.

b. The material contained in this manual is applicable to both nuclear and nonnuclear warfare.

c. Users of this manual are encouraged to submit recommended changes and comments to im-

prove the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons will be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to the Commandant, U.S. Army Infantry School, Fort Benning, Ga., 31905.

2. Use of Glossary

This manual contains a glossary of terms and definitions peculiar to pathfinder operations. Users of the manual are urged to refer to this glossary as an aid to understanding the text.

CHAPTER 2

PATHFINDER DETACHMENT

3. General

a. Concept. Pathfinders are introduced by land, sea, or air into an objective area to establish and operate navigational aids for guiding aircraft to the drop or landing zones. Pathfinders may be used in the loading areas to control air traffic within the loading areas and between the loading areas and the initial point (IP). Pathfinders in the objective area control air traffic within the drop and landing zones and between the communications checkpoint and these zones. Air traffic between the IP and communications checkpoint may be monitored and regulated by the flight coordination center.

b. Mission. The mission of Army pathfinders is to establish navigational assistance to and control Army aircraft in areas designated by supported unit commanders.

c. Assignment and Attachment. Pathfinder detachments are allocated on the basis of one for each aviation battalion which has a troop lift capability. When authorized as an augmentation, a pathfinder detachment normally is attached to the aviation unit, but may be attached to ground units to enhance the capability of these units to execute air-delivery operations.

d. Organization. A detachment has 2 officers and 13 enlisted men. Each man must be a qualified parachutist and capable of performing the duties of other detachment members.

4. Capabilities and Limitations

a. Capabilities. Pathfinder detachments are capable of—

- (1) Indicating with electronic and visual navigational aids the desired direction(s) and route(s) of movement for aircraft and the identity of selected points on the terrain; the identity and location of parachute and air-land delivery areas; emergency ground-to-air signals; direction of landing, runway, taxiways, and parking areas for airplanes; the presence

of obstacles and directions and points of landing for helicopters.

- (2) Furnishing aviators, tactical commanders, and higher headquarters with information relative to the enemy and friendly situation, the wind, the weather, visibility, terrain conditions, chemical and radiological survey readings, and condition and elevation of delivery areas.
- (3) Providing aircraft commanders the necessary controls including directions, times, landing sites, traffic patterns, altitudes, formations for parachute deliveries; and providing taxi, hover, parking, and take-off instructions.
- (4) Selection and limited improvement of the exact areas for parachute, air-landed, and assembly operations, based upon reconnaissance information.
- (5) Indicating (by visual aids) the location of aircraft parking and unloading points, the initial direction of movement, and the designated assembly points for air-delivered troops, equipment, and supplies.
- (6) Furnishing operators to operate radio and/or wire communications within landing zones and between these zones and the headquarters directing the operation. The wire-laying capability of these detachments is limited.
- (7) Infiltrating an objective area by any land, sea, or air means.
- (8) Operating drop or landing zones in forward areas for parachuted or air-landed supplies using airplanes and/or helicopters.

b. Limitations. Organic personnel and equipment strength of pathfinder detachments require that capabilities be limited primarily to aircraft guidance. It is necessary that these detachments be augmented by additional personnel from a supported unit to—

- (1) Provide security.
- (2) Remove obstacles.

- (3) Perform detailed radiological surveys.
- (4) Recover and assemble equipment and supplies.
- (5) Reconnoiter and mark troop assembly areas, if used.
- (6) Operate additional ground net radios and telephones.
- (7) Transport items of equipment.

5. Employment

a. The pathfinder detachment is employed under the command and control of the unit to which it is attached.

b. To accomplish its mission, the pathfinder detachment is capable of performing the following:

- (1) Operate a helicopter landing zone containing four helicopter landing sites.
- (2) Operate an airplane landing zone containing two landing strips.
- (3) Operate two resupply or parachute drop zones.
- (4) Operate three LOLEX sites.
- (5) Perform limited radiological reconnaissance.

Note. The pathfinder detachment has the capability of separating into two independent elements and providing the above assistance on a reduced basis to two supported units operating over a wide area.

c. During these operations, pathfinders establish and operate drop or landing zones for the landing of troops, equipment, and supplies. They assist aircraft in the resupply, reinforcement, and evacuation of units within the combat zone.

d. Pathfinders precede the main assault elements into the delivery area, and arrive in sufficient time to properly perform their assigned missions. The amount of time needed depends on the mission(s), the number of pathfinders available, the means of delivery employed, the enemy situation, the terrain, and the weather. Normally, the required time varies from 10 to 30 minutes. However, the tactical situation may dictate earlier employment. If pathfinders are to be delivered after evening nautical twilight, more time must be allowed for the completion of ground reconnaissance.

e. If the delivery of pathfinders ahead of the main body will compromise security, the pathfinders accompany the lead element of the main body and assist all subsequent flights. This procedure is especially applicable to daylight operations on terrain that aviators can locate without

assistance. The need for aircraft control increases as the operation progresses. Enemy action, mechanical failures, saturation of delivery areas, and desired changes in the landing plan to meet the changing tactical situation dictate efficient ground control of aircraft.

f. Aviators and transported troops must understand the purpose of the aids displayed and the techniques employed. Unit commanders must be thoroughly briefed on pathfinders' responsibilities and capabilities, including the control of air traffic within the drop or landing zones.

g. Pathfinder communication nets are available for use by the tactical unit commander. However, the use of these communication nets to perform pathfinder missions will take priority.

h. Because of the size and importance of the operation, more than one pathfinder detachment may be required.

i. Aviators employed to transport pathfinder units are responsible for delivering them to the desired location at the scheduled time. This requires coordination between aviators and pathfinders, including in-flight communication and observation of the ground from the troop compartment. The pathfinder aircraft may be equipped with special navigational devices. Checkpoints en route may be indicated by artillery fire, flares, navigational aids, or by partisans or patrols.

j. The pathfinder detachment coordinates its operations with those of the supported ground unit. To achieve maximum coordination, the pathfinder detachment must be familiar with the—

- (1) Ground tactical plan.
- (2) Landing plan (includes timing and phasing of troops and equipment based on the ground tactical plan).
- (3) Air-movement plan (based on the landing plan).
- (4) Loading plan (based on the air-movement plan).

6. Training

a. Responsibilities. Commanders of major units to which pathfinder detachments are assigned are responsible for pathfinder detachment training and proficiency, and for integrating this training with that of aviation and ground units.

b. Standards. Pathfinders will be trained to accomplish the missions and duties prescribed in

this manual in accordance with the highest standards of proficiency.

7. Pathfinder Equipment

a. General. The TOE of the pathfinder detachment provides equipment essential to pathfinder operations. However, additional equipment may be required when the detachment is committed to its maximum capability.

b. Navigational Aids. Navigational aids are used to help aviators locate an exact area. Electronic and visual navigational aids are the two principal types employed.

- (1) *Electronic aids*, which include homing beacons and radios, employ a radio signal. They have a greater range and provide more security than visual navigational aids. While radio ordinarily is considered an insecure means of signaling, it is a relatively secure means in pathfinder operations because of the time required by an enemy to obtain a direction finding (DF) fix and dispatch a force to the area.
- (2) *Visual navigational aids* are used to designate specific areas or points in landing and drop zones. They are also used in transmitting ground-to-air signals. Daytime visual navigational aids include panels and smoke. Night visual navigational

aids include light beacons, lanterns, baton flashlights, and pyrotechnics. Visual navigational aids provide less security in that flares, pyrotechnics, and other illuminating devices may be easily seen by the enemy.

c. Communication Equipment. Organic communications equipment insures the capability of ground-to-air and internal net voice radio communications. A capability of a homing signal has been incorporated into most of the communication equipment to provide additional navigational assistance.

d. Assembly Aids. Assembly aids are used to designate troop or supply assembly areas. As with navigational aids, there are two principal types of assembly aids: electronic and visual.

- (1) *Electronic assembly aids* include radios and homing devices which employ a radio signal. They provide more security and greater range than visual assembly aids.
- (2) *Visual assembly aids* are simple to employ and afford positive identification of assembly areas, but they can be seen by enemy and friendly troops. Visual assembly aids include panels, smoke, and armbands for day operations; lanterns, flashlights, light beacons, and pyrotechnics for nighttime operations.

CHAPTER 3

PLANNING

Section I. PRELIMINARY PLANNING

8. Initial Coordination

a. Pathfinder detachments are made available to supported units by arrangement with the division G3.

b. At the earliest practicable time, the commander issues a warning order to alert the pathfinder detachment to its forthcoming support mission and also establishes liaison with the commanders of the supported ground unit and the supporting aviation unit.

9. Initial Preparations

a. Inspection of the pathfinder unit's personnel and equipment begins immediately upon receipt of the warning order. Personnel transfers and replacements and equipment augmentation should be accomplished as the needs arise.

b. Equipment is prepared in accordance with the following priority:

- (1) Navigational aids.
 - (*a*) Electronic.
 - (*b*) Visual.
- (2) Ground communication equipment.
- (3) Weapons.
- (4) Assembly aids.
- (5) Miscellaneous items.

c. As additional information is received, pathfinders are reorganized as necessary within the detachment to be better prepared to accomplish the specific mission. Time permitting, additional training and rehearsals should be conducted, using terrain that most nearly resembles the objective area.

d. Security is mandatory for the success of the operation. Therefore, personnel should be provided the minimum essential information needed to complete each phase of the operation. Individuals who have received detailed information about the operation should be isolated for security reasons.

10. Joining with the Supported Unit

a. Pathfinders join the supported unit at the appointed time and place. If conditions will allow, final coordination among the unit, aviation, and pathfinder commanders is accomplished at this time. This coordination includes but is not limited to the following:

- (1) Ground tactical plan.
- (2) Landing plan (includes timing and phasing of troops and equipment based on the ground tactical plan).
- (3) Air-movement plan (based on the landing plan).
- (4) Loading plan (based on the air-movement plan).

b. The pathfinder detachments and the aviation units are designed to support the tactical operations of the ground unit commander. Drop or landing zones are selected to support the ground tactical plan. Alternate drop or landing zones must be prearranged for emergency use. Circumstances under which they will be employed must also be prearranged. One or more drop and/or landing zones may be operated within the same airhead if sufficient pathfinder personnel and equipment are available (fig. 1).

c. The landing plan must support the initial assembly of troops, supplies, and equipment. Unloading and assembly operations must be conducted without interfering with the arrival and departure of aircraft. To accomplish this, aircraft, personnel, supplies, and equipment must be rapidly cleared from the landing and parking areas. Since only tentative direction of landing and areas for landing and parking can be determined before the pathfinder reconnaissance is completed, specific unloading and initial assembly points cannot be designated until after pathfinders have arrived in the objective area. Upon arrival, pathfinders designate exact unloading and initial assembly points as near unit assembly points as

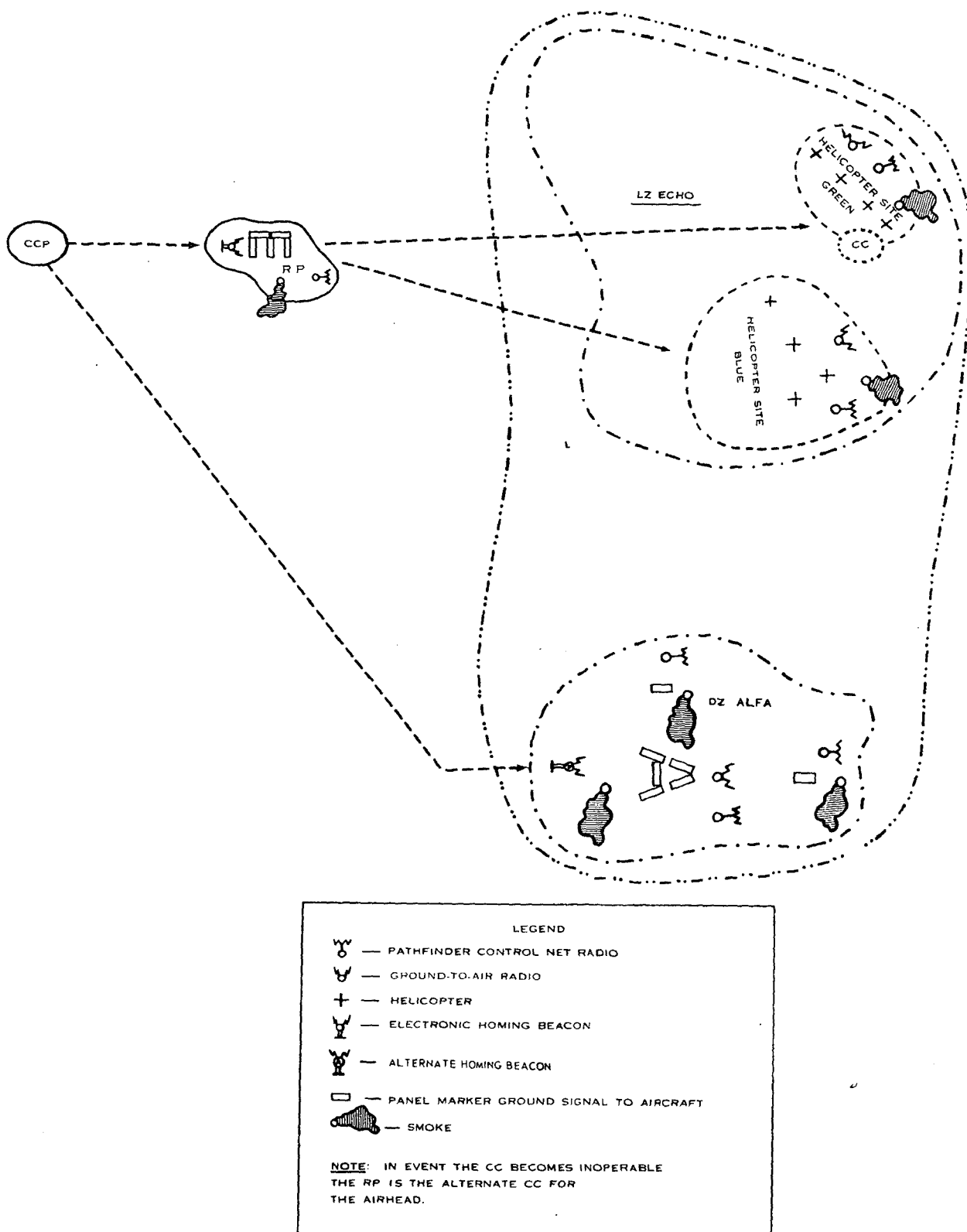


Figure 1. Airhead with one drop zone and one helicopter zone.

practicable. Individuals move from initial assembly points marked by pathfinder personnel to their preplanned unit assembly areas prescribed by the unit commander.

d. The aircraft-landing or parachute-delivery plan should assure that the desired personnel and equipment are delivered in the objective area at the time and place prescribed. The plan should permit a maximum number of aircraft deliveries in a minimum amount of time. Efficiency of the plan will depend upon the capabilities of the involved pathfinder and aviation units.

e. The air-movement plan includes delivery of pathfinders and main assault elements. Routes to and from the drop or landing zones are selected to provide maximum protection to aircraft, to maintain the security of the operation, and to support the landing plan. Pathfinders assist in the movement of the main element by operating navigational aids and furnishing guidance and control to the aircraft. In the airhead, pathfinders control the activities of all aircraft within the drop and/or landing zones to insure safe and efficient operations. Recognized aviator prerogatives in emergency situations remain in effect. Aviators will make every effort to inform pathfinders of emergency measures being planned or taken.

f. Consideration should be given to furnishing artillery, armed helicopters, and tactical air support to the pathfinder party.

11. Coordination

a. Commanders of ground and aviation units coordinate and preplan the details of operations which require pathfinder assistance. The pathfinder detachment commander may make recommendations on the location of the drop or landing zone, landing formation, and the time schedule to be followed. The actual drop or landing zone is selected by the commander of the supported unit and is based upon terrain considerations, objectives, and the advice of the aviation unit commander. The aviation unit commander coordinates with the ground unit commander on such matters as flight formation, time schedule, primary and alternate flight routes, communication checkpoints, and types of loads.

b. The pathfinder detachment commander coordinates with the aviation unit commander on exact landing and/or drop zone requirements in terms of specific areas, desired ground conditions, and types of navigational aids to be used. The

detachment commander also coordinates with the pathfinder aviators on exact flight routes, suitable checkpoints, and time schedules.

12. Final Preparations

a. Based upon coordinated plans for the operation, the pathfinder detachment commander requests the necessary augmentation in personnel and equipment. He bases this request upon the planned use of personnel and equipment for security operations; for assembly of personnel, supplies, and equipment of supported units; for removal of obstacles; for radiological survey; for operation of ground net communications equipment; and for transportation and operation of navigational and assembly aids under pathfinder direction. Personnel and equipment augmentation must be in keeping with the transportation means to be used in delivering the pathfinder party. When feasible, a unit liaison and fire support group accompanies the pathfinder party to provide artillery and tactical air support. When thus reinforced, the pathfinder party remains under the full command of the pathfinder commander who is responsible for the functions of the entire team.

b. The pathfinder commander issues his operations order to the reinforced detachment as soon as practicable. The operations order may be issued as a series of fragmentary orders based upon available information or the necessity to disseminate it. The commander assures that individuals receive a detailed briefing of their exact duties. They should be given an opportunity to study pertinent maps, airphotos, and terrain models of the objective area. Pathfinders, in particular, must be thoroughly briefed on the location and operation of proposed air-landing or air-delivery facilities, the flight route, flight formation, time schedule, and communication checkpoint.

c. A final detailed check is made of the equipment to be used in the operation. A decision is made on the exact manner in which the equipment is to be transported into the objective area. All items of equipment are prepared for rapid displacement.

d. A final weather and operation briefing is held at the departure area just prior to departure. A final coordination meeting with the ground and aviation unit commanders and the pathfinder aviators is also held at this time.

Section II. DELIVERY OF PATHFINDERS

13. Method of Delivery

Pathfinders can be delivered by any of a variety of ground, sea, or air transportation means. The two means most often employed are parachuting or landing by helicopter (fig. 2). Helicopters can also be used to deliver pathfinder detachments by parachute. Procedures for parachute delivery from specific types of aircraft are contained in TM 57-220.

14. Air Delivery

a. Parachute Delivery.

- (1) Parachute delivery from airplanes affords greater range and speed of movement than air delivery by helicopter.
- (2) Based upon wind conditions, pathfinders compute their desired parachute release points prior to arrival in the area. Parachute jumps are made at the lowest practicable altitude in order to assure accuracy and security. Jump altitudes for personnel are prescribed in standing operating procedures for the types of aircraft involved and will vary in accordance with peacetime and wartime restrictions.
- (3) When parachuting into an area, pathfinders carry on their person the essential operational items of equipment. This technique insures maximum protection of fragile items and provides immediate access to operational equipment immediately upon landing.

b. Landing by Helicopter.

- (1) Landing by helicopter is more accurate than parachute delivery and can be carried out under higher wind conditions. Rappelling techniques permit trained personnel to land from helicopters hovering over objective areas. These techniques are effective in terrain which precludes both helicopter landings and parachute drops. More personnel and equipment in a better state of operational readiness can be delivered by helicopters. Use of helicopters furnishes a means of aerial radiological monitoring and pathfinder evacuation; enables nonparachutists to accompany pathfinders in a supporting role, and offers a delivery

means when low ceilings prohibit parachuting.

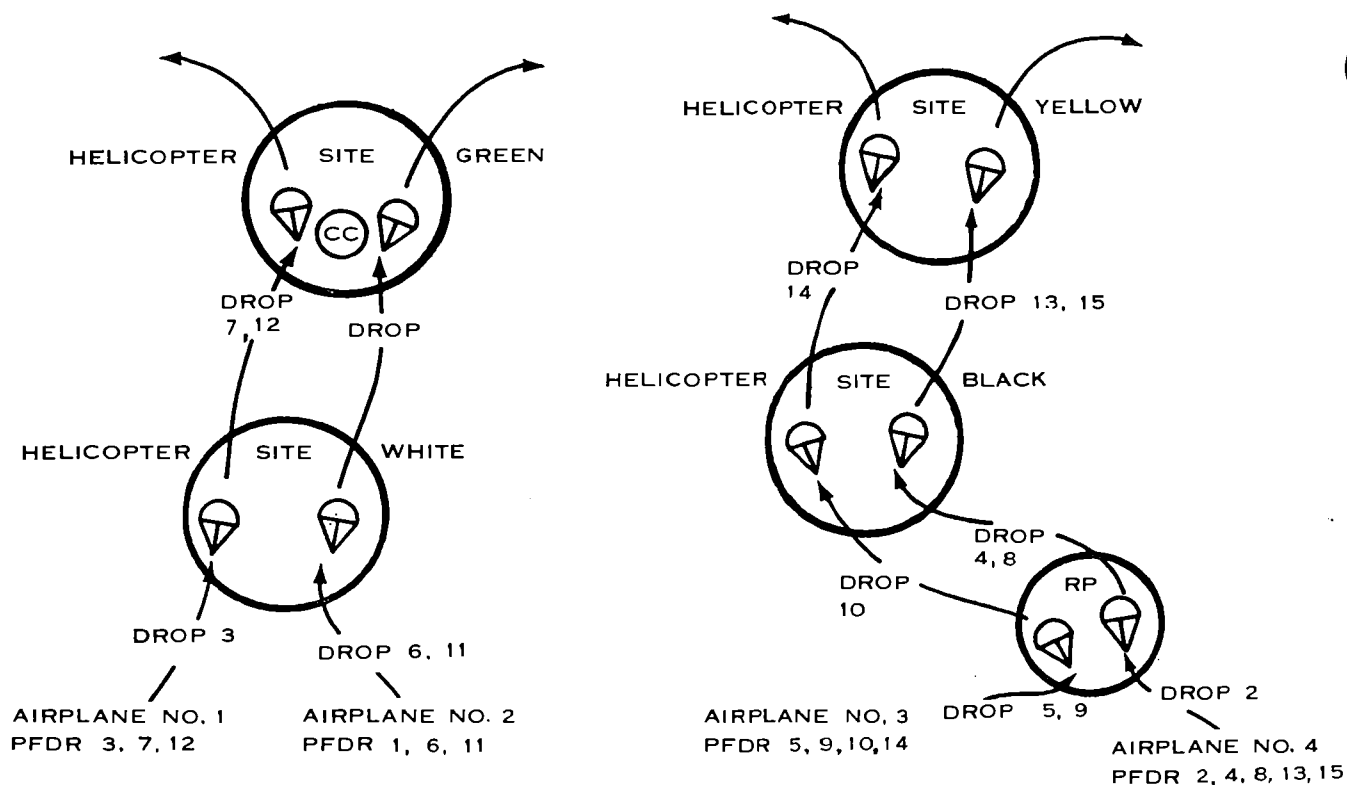
- (2) Upon arrival in the objective area, pathfinders perform a hasty visual reconnaissance of their respective areas of operation. If they are not delivered to the desired points, they are moved by helicopter to the proper locations as quickly as possible. Pathfinder helicopters remain at each location until released by the senior pathfinder present.
- (3) When possible, the pathfinder detachment should be transported in two or more helicopters. Each helicopter should make a minimum number of deliveries in order to speed the operation. Helicopters may land at a concealed terrain feature while pathfinders perform certain functions such as displaying visual aids, and then transport personnel to other points. Helicopter movement in the landing zone should be restricted in order to minimize the noise and/or dust which could reveal friendly positions and intentions to the enemy.
- (4) When possible, one helicopter should remain within the objective area to provide pathfinders with an alternate means of transportation, observation, and communication.

c. Landing by Airplane.

- (1) Landing by airplane is more accurate than parachute delivery. Also, more personnel and equipment can be delivered in a better state of operational readiness by air-landing than by parachuting. Airplane landings enable nonparachutists to accompany pathfinders and offer a possible delivery means when low ceilings prohibit parachuting.
- (2) As compared to helicopter delivery, landing by airplane gives greater range and speed of movement. The necessity for comparatively large, obstacle-free landing areas, however, limits the use of airplanes for pathfinder delivery.

15. Landing by Sea

Delivery by water includes the use of surface and underwater craft. It is considered the most



- PFDRS PARACHUTE TO SITE AT POINTS INDICATED BY THIS SYMBOL
- PFDRS LAND ON SITE AT POINTS INDICATED BY THIS SYMBOL
- RP — RELEASE POINT FOR ACFT OF MAIN BODY
- CC — CONTROL CENTER FOR LANDING ZONE

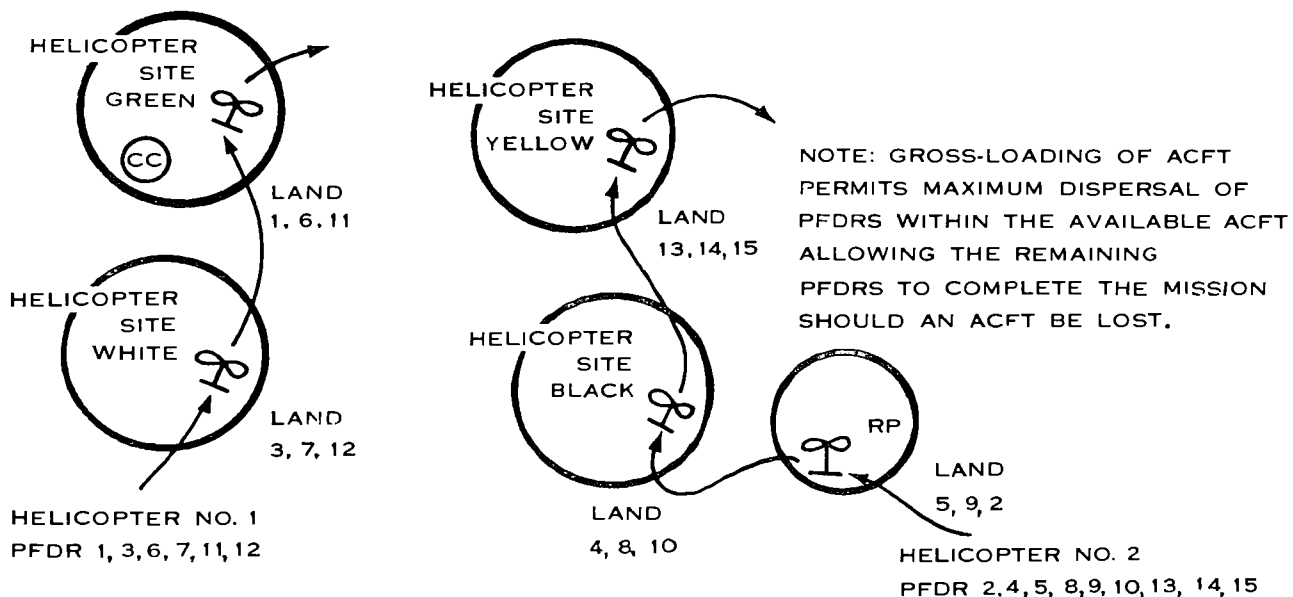


Figure 2. Air delivery to multiple sites (above). Air landing at multiple sites by helicopter (below).

secure and economical means up to the point of debarkation from the parent craft. Movement from landing site to final destination is accomplished by land infiltration.

16. Overland Movement and Stay-Behind

a. Overland Movement. Infiltration by land is generally the least desirable means of delivery and is usually limited to short movements by individuals or small detachments. Land infiltration is best accomplished under conditions of limited visibility over difficult terrain. Land infiltration has its greatest chance of success when the enemy's

lines are overextended, the combat zone fluid, or portions of his boundaries are inadequately secured. On the other hand, a well-organized, stable and closely knit defense in depth may prohibit land infiltration.

b. Stay-Behind. Stay-behind involves prepositioning pathfinder detachments within their proposed operational areas and remaining hidden while the enemy advances through and/or occupies these areas. Stay-behind operations may be considered when the enemy has the capability of overrunning friendly areas, and an airmobile attack has been planned to reoccupy the area.

Section III. ACCOMPLISHMENT OF MISSIONS

17. Capabilities

a. An essential element of a successful pathfinder operation is communication by ground-to-air voice radio. This radio is one of the first items placed in operation by pathfinders, and it should be the last item of equipment taken out of operation. Pathfinders must have a thorough understanding of voice radio procedure. To achieve the necessary speed and clarity of transmission, radio discipline must be practiced by pathfinders and aviators. Extraneous and unnecessary messages should be omitted. Because of the amount of vital information exchanged, the copilots of aircraft normally record the more important portions of messages. Aviators repeat vital portions of a ground-to-air message to insure that proper instructions are being followed. For examples of ground-to-air message transmissions, see paragraphs 26, 31, and 38.

b. Upon arriving in the objective area, pathfinders perform a hasty reconnaissance, select the desired locations, assemble the assigned personnel and equipment at these locations, and establish the necessary electronic and visual aids. They perform these functions as rapidly as possible. In most cases they perform two or more simultaneously. Each person performs his assigned task. No one task requires the services of the assembled group.

c. Following completion of the reconnaissance, pathfinders must report the results to the control center. Any pertinent information should be transmitted to the control center as soon as possible after the pathfinder landing. This information is transmitted from the control center over the pathfinder internal net to insure centralized con-

trol of the zone. The pathfinder detachment commander takes immediate steps to determine and transmit other needed information to the individuals most directly concerned.

(1) He notifies the supported unit commander of—

- (a) EEI as required by operation order.
- (b) Results of radiological monitoring.
- (c) Conditions that might require changes in landing zones (LZ's), drop zones (DZ's), or assembly areas.

d. In addition to the augmented personnel which function under pathfinder command, the following personnel may accompany the pathfinder detachment when appropriate: forward air controllers, artillery observers, and liaison personnel who can communicate with the unit commander.

18. Assembly After a Mission

a. When a mission has been completed, the pathfinder detachment assembles with its equipment and returns to its parent organization.

b. Upon completion of a mission, attached or augmented personnel revert to their parent units. They may do this prior to assembly of pathfinder personnel.

c. The pathfinder detachment commander notifies his parent unit commander of the completion of the detachment mission, the operational readiness of the detachment, and takes immediate steps to prepare his detachment for further operations.

19. Secondary Employment

a. Pathfinder personnel and equipment remain assembled at the unit command post except when

performing pathfinder duties for subordinate units.

b. When the pathfinder detachment has completed preparations to perform further missions, it may be employed within the command post of the supported unit to—

- (1) Assist communications personnel by operating radios or telephones.
- (2) Assist in minor demolition, radiological survey, and mine warfare tasks.
- (3) Assist staff sections by performing map and aerial photo work.

(4) Augment local security by acting as interior and exterior command post guards.

c. Training and maintenance may, as required, take priority over performance of secondary missions.

d. The pathfinder detachment must be able to perform any of the assigned pathfinder missions with a minimum of preparation.

e. The pathfinder detachment may be employed to operate drop zones for air delivery of supplies, equipment, or personnel from U.S. Air Force aircraft in the absence of USAF combat control teams.

CHAPTER 4

CONTROL CENTER AND RELEASE POINT

20. Drop and/or Landing Zone Control Center

a. General. The purpose of the control center (CC) (fig. 3) is to promote safe, orderly, and expeditious air movement. The CC is the pathfinder command post and communications center. Its location is tentatively selected by map reconnaissance and airphoto study and is coordinated with the commander of the supported unit. The tentative location is changed if ground reconnaissance indicates it is not suitable. Ideally, the control center should be situated on terrain that permits effective communication, visibility, and security. The pathfinder commander normally locates himself at the most important facility within the zone and directs pathfinder operations at outlying facilities by means of the pathfinder internal net. Long-range communication with the supported unit is normally established from the control center. When the CC is established at an airplane facility, its radios must be set up far enough from the landing, taxiing, and parking installations to prevent aircraft engine noise interference in radio transmissions. In addition, terrain masks must be carefully avoided if the CC is to make and maintain radio contact with all other operating facilities. The basic organization of the control center remains essentially the same for all pathfinder operations.

b. Organization and Duties of the CC Party.

- (1) The CC should be organized to meet the requirements of the mission. A typical organization consists of—
 - (a) *Pathfinder detachment commander.* He acts as the LZ, DZ, and landing site commander and controls aircraft landings and departures or air deliveries. To provide maximum support, he may also be the ground-to-air radio operator ((b) below).
 - (b) *Ground-to-air radio operator.* He operates the radio used to maintain communication with aircraft in flight,

and aids in the control of aircraft by observation.

- (c) *Pathfinder internal net operator.* He operates the radio used to maintain communication with other elements of the detachment. He aids in the control of aircraft by observation, and he maintains a record (app. II) of aircraft arrivals and departures and the general types of loads. He places the alternate homing beacon in operation on order.
- (d) *Security personnel.* They defend the landing site against enemy attack, assist in carrying and installing equipment, and provide other assistance as necessary.

21. Release Point

a. General. A release point (RP) (fig. 4) is established to provide a traffic control point and final navigation checkpoint for aircraft approaching the landing or air-delivery facilities within a landing area. The RP is used primarily to control helicopter traffic into an LZ containing multiple helicopter landing sites, but it may also be used as an aid to navigation and traffic control when more than one drop and/or landing facility is established in an area. The RP location is tentatively selected from map and airphoto studies as a point on the planned flight route to the zone. It should be located on a prominent terrain feature or on high, open terrain which allows maximum effective use of long-range electronic and visual navigational aids. Through duplication of equipment, the release point, in case of an emergency, can assume the duties of the control center. Also, the control center can assume the duties of the release point if required.

b. Organization and Duties of the RP Party.

- (1) The RP party will include one pathfinder with attachments or at least two pathfinders. The pathfinders position

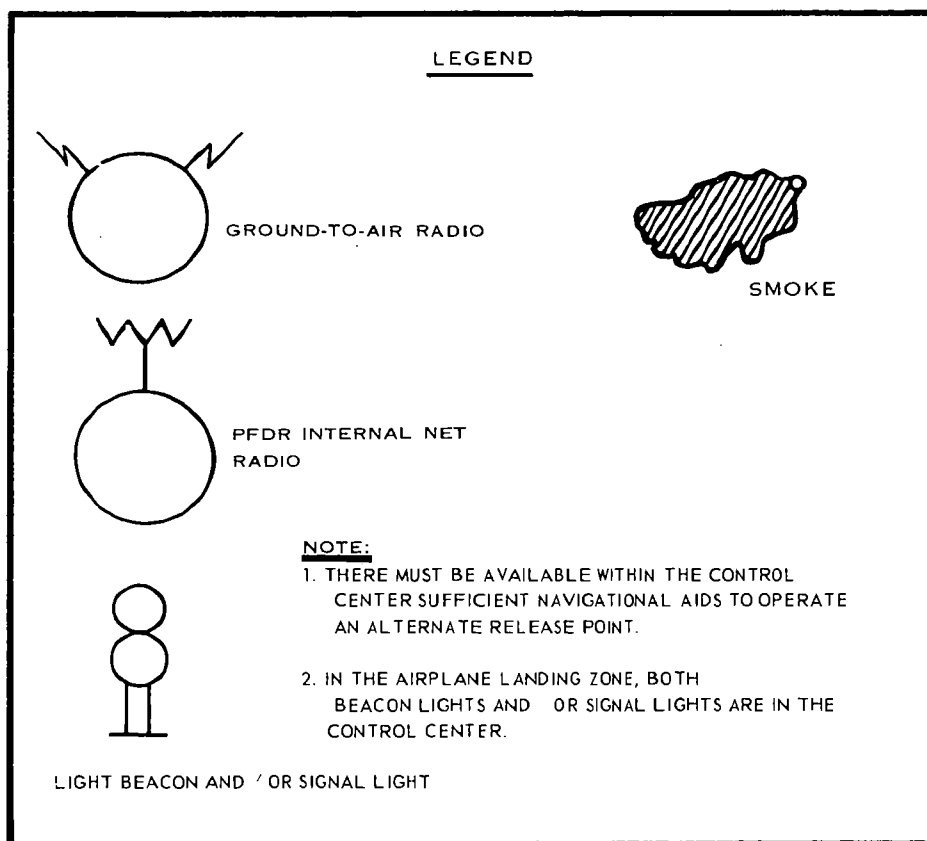
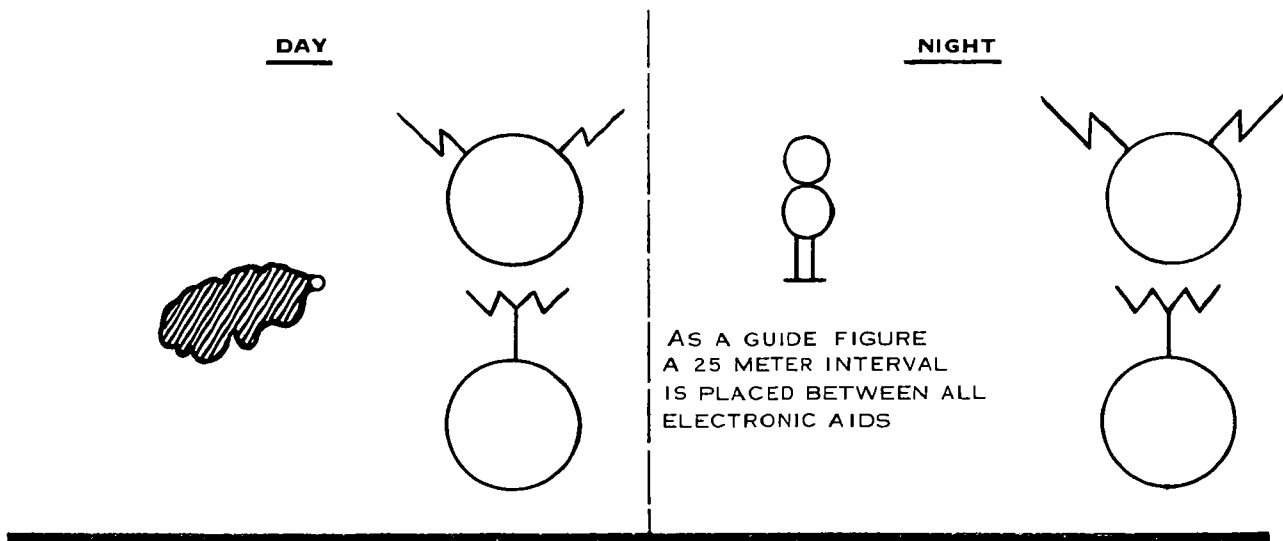


Figure 3. Control center.

and operate the electronic and visual navigational aids. They also operate a radio in the pathfinder internal net.

- (2) The party may include attached personnel to defend the RP against attack and

assist in carrying, assembling, and operating equipment.

c. *Operation of the RP.*

- (1) The pathfinder in charge of the RP, assisted by available security personnel as

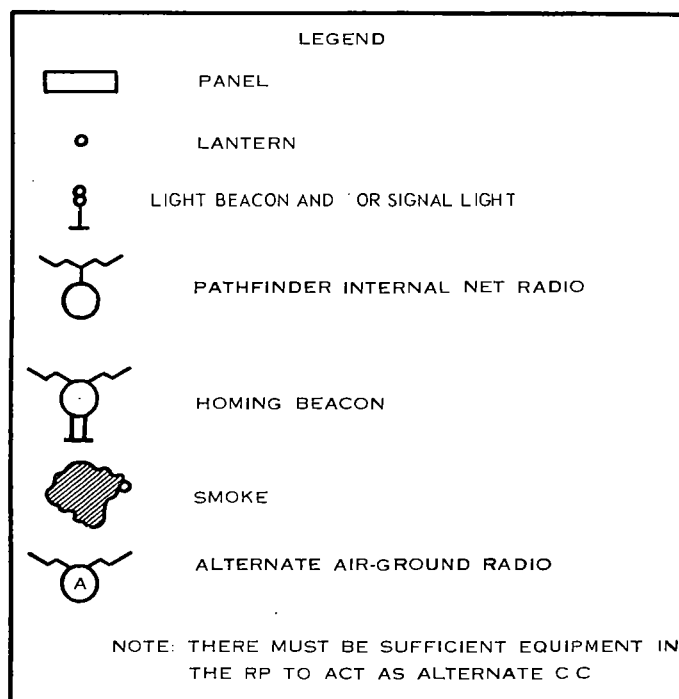
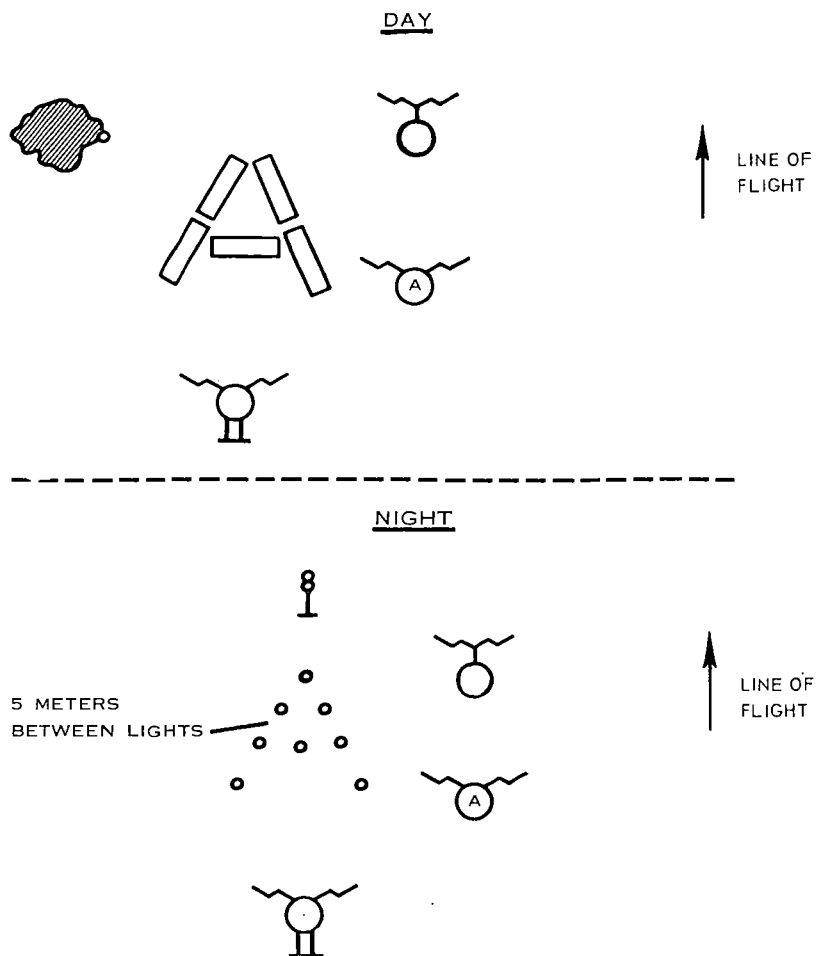


Figure 4. RP (release point).

needed, immediately installs the navigational aids.

- (a) He first prepares the electronic homing beacon for operation since it affords long-range guidance and greater security than visual aids. He locates the beacon far enough away to prevent excessive interference with the ground radio and to reduce the possibility of enemy fire destroying both radio and beacon simultaneously. He places the beacon in operation at the prescribed time or on order from the CC.
- (b) He then prepares the visual navigational aids for operation. Visual navigational aids are used to indicate loca-

tions aviators can positively identify (figs. 1 and 4). Grass or brush may have to be removed to prevent masking these aids.

- (2) The pathfinder internal net radio operator establishes communication with the CC as quickly as possible to report the state of readiness of the RP and provide information on the enemy situation. He keeps his radio on constant standby, unless directed to operate it on a definite time schedule.
- (3) Security personnel move to assigned locations and take up firing positions or assist in establishing and operating navigational aids and communication equipment.

CHAPTER 5

HELICOPTER LANDING ZONES

22. General

A helicopter landing zone contains one or more helicopter sites. It may have its own CC and RP, or it may use these in conjunction with an adjacent DZ or LZ.

23. Detachment Organization and Duties

To operate a helicopter landing zone the pathfinder detachment is organized into three basic parties: the control center (CC) party, the release point (RP) party, and the site party.

a. Control Center and Release Point. A control center and release point are required to operate a helicopter landing zone. The CC and RP are organized and operated as described in chapter 4.

b. Site Party. The site party consists of a site commander, the site operator, a pathfinder radio operator, and attached personnel whose principal duties are to reconnoiter, prepare, and mark the site.

- (1) *The site commander* is responsible for the organization and operation of the helicopter landing site. He supervises the site and may replace any member of the site party.
- (2) *The helicopter site operator* assists in the positioning and operation of assembly and navigational aids, and preparation of landing points for each helicopter.
- (3) *The pathfinder radio operator* operates the radio(s) and/or telephone used to maintain communications with the CC and/or aircraft.
- (4) *Other personnel* may be attached to the helicopter site party to—
 - (a) Assist in the unloading and initial assembly of troops, equipment, and supplies, and operate assembly aids as directed by the site commander.
 - (b) Assist in carrying and installing pathfinder equipment and remove or mark obstacles at landing and assembly points.

24. Selection of Landing Sites

a. Minimum landing space requirements and minimum distance between aircraft depend upon a number of variables and should be prearranged by the aviation unit commander in coordination with the pathfinder detachment commander. The final decision concerning minimum landing requirements rests with the aviation unit commander. In selecting helicopter landing sites from maps, aerial photographs, and actual ground reconnaissance, the following factors are considered:

- (1) *Size of landing point.* As a guide, helicopters need a cleared area at least 50 meters in diameter for landings. The exact size of the area will depend on the type of helicopter to be landed.
- (2) *Number of helicopters used.* An important factor is the number of helicopters required to land simultaneously at one site to provide the troop strength needed to accomplish the mission. It may be necessary to provide an additional landing site nearby or to land the troops in successive flights at the same site.
- (3) *Surface conditions.* Surface conditions must be good enough to prevent helicopters from bogging down, creating excessive dust, or blowing dry snow. Loose debris that may cause damage to the rotor blades must be removed.
- (4) *Ground slope.* Normally, if the ground slope is greater than 15 percent helicopters cannot land safely.
- (5) *Approaches to the landing site.* The direction of landing should be into the wind, especially at night. However, if there is only one good approach, aircraft can land with a light crosswind; or if surface wind is light, aircraft can land downwind.
- (6) *Prevailing winds.* Of the two factors—approach route ((5) above) and prevailing wind—the best approach route is the

more important factor unless the wind velocity exceeds 10 knots.

- (7) *Density altitude.* The density altitude is affected not only by altitude, but by temperature and humidity. For planning purposes, as density altitude increases, the size of the landing site must be increased proportionately.
- (8) *Loads.* Some helicopters cannot ascend or descend vertically when fully loaded; therefore, a larger landing area is required for fully loaded helicopters than for empty or lightly loaded ones.
- (9) *Obstacles.* Landing sites should be free of telephone or powerlines, tall trees, or similar obstructions on the approach and departure end of the landing site that may interfere with the helicopter landings and takeoffs.

b. Detailed information on the effects of air density, slope, and surface conditions on landing zone requirements is contained in TM 5-330. The helicopter unit commander makes the final decision on minimum landing requirements. These requirements must be available to the pathfinder detachment commander in the early planning stages for the mission.

c. When tentative landing sites have been selected, pathfinder personnel are thoroughly briefed on their specific worksites. Aerial photographs are especially useful for this briefing. In any case, these should be made available prior to the start of operation so each person will have an accurate mental picture of his landing site.

d. Use of attached personnel to assist in ground reconnaissance should be carefully planned ahead of time. These personnel should be thoroughly briefed and rehearsed.

e. Selections of primary and alternate helicopter landing points must be made at each landing site. Alternate points are chosen to permit operation of a landing site in case a primary point becomes inoperative.

f. It is desirable that each helicopter landing site be within ground communication range of the other sites, the control center (CC), and the release point (RP). The range of the AN/PRC-25 radio requires that each landing site be within an 8-kilometer radius of the control center.

g. Alternate sites may be needed because of enemy action, ground conditions, or changes in the tactical or logistical situation. They are selected

primarily to support the tactical plan. The ground commander or his representative decides when alternate sites will be used, and the pathfinder commander informs the landing site operators of the change to alternate sites.

h. A more detailed discussion of helicopter site selection is contained in TM 5-330.

25. Establishment of the Landing Site

a. The pathfinder radio operator establishes and maintains communication as directed.

b. The site commander determines the direction of landing, intercept azimuth (if required) and landing formation immediately upon his arrival, and transmits this information to the CC as promptly as possible. He then selects the exact landing point for the lead helicopter. He controls the landings and takeoffs of helicopters and furnishes information to the CC.

- (1) It is undesirable for a helicopter to fly directly over another aircraft on the ground; therefore, in a tactical heavy-left landing formation, the landing point for the first helicopter must be the farthest forward (fig. 5). Whether the aids are arranged for landing a flight on line or in trail formation depends upon available landing space, number and types of obstacles, and prearranged flight formations. In a tactical situation it is desirable that aircraft land in the same formation in which they fly unless the landing area precludes this. Landings on line are preferable because this procedure eliminates danger of overshooting the landing point and colliding with a parked helicopter (fig. 1—helicopter site green). When helicopters are to land in trail formation, the landing points should be staggered laterally to reduce the danger of collision, especially at night.

- (2) Lanterns are used to mark landing points and indicate the direction of landing for a night operation (fig. 5). Lights of different colors may be used to designate different helicopter sites. T-lanterns indicate the landing point for the lead aircraft of each platoon or flight and the direction of approach. Helicopters land with the right landing gear or skid just to the left of the lantern. Lights must be beamed in the direction from which the

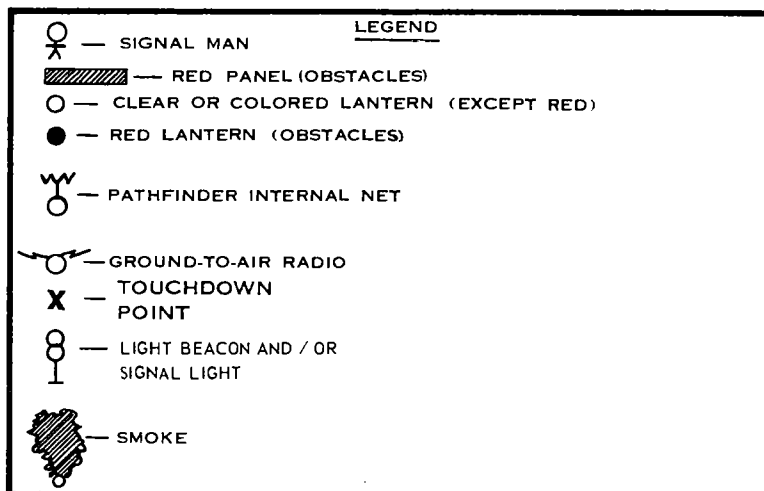
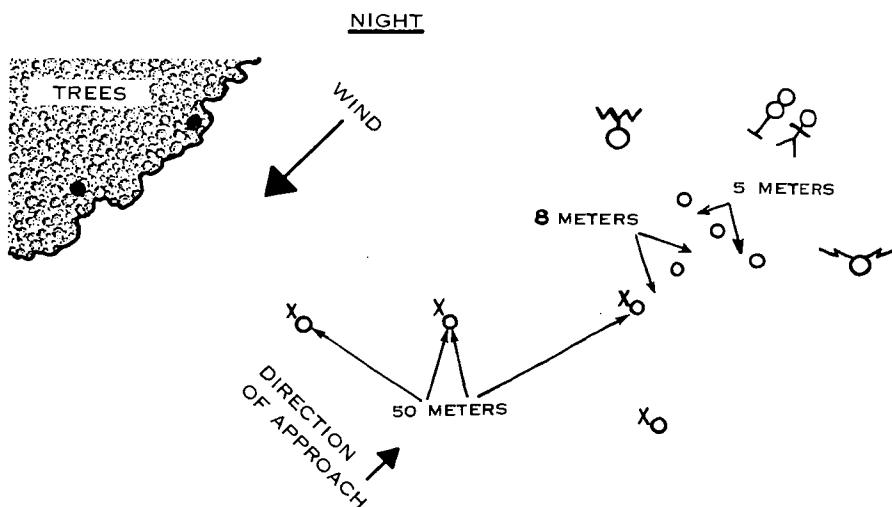
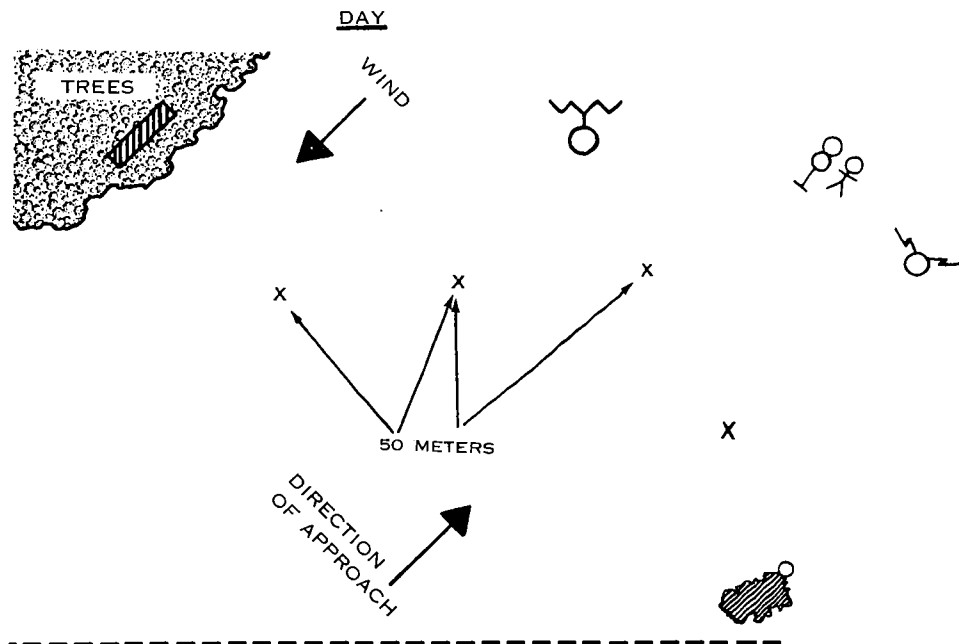


Figure 5. Helicopter landing site.

helicopters approach. If the landings are to be made at night, all landing points must be marked (fig. 5). During daylight, landing points are not marked; however, a signalman is used to land the lead aircraft (fig. 5).

c. The helicopter site operator marks obstacles, landing points when required, and assists the site commander in site preparation.

d. After selecting the landing sites, pathfinders immediately reconnoiter and prepare the landing points. They make hasty improvements at the landing points by removing brush and filling holes. They remove obstacles from approach and departure paths and mark them with red panels or red lights or both. Improvements of the site should be continued as long as necessary.

e. Pathfinders mark initial assembly points for troops, equipment, and supplies. These points are located to facilitate assembly so that the helicopter site is cleared quickly and easily. If unit assembly areas are to be used, they are preselected by the ground unit commander. Supported ground unit personnel accompanying the pathfinders mark the unit assembly areas, establish assembly aids, act as guides, and assist in unloading operations to insure rapid clearance of personnel, supplies, and equipment from the immediate vicinity of the landing points.

f. Security personnel move to their assigned locations and take up firing positions, or they may assist pathfinders in establishing the site.

g. The azimuth from the RP to the landing site should coincide as closely as possible with the actual landing direction of preclude sharp turns with formations of aircraft. The larger the formation the more important this becomes. If a straight-in approach and landing is not possible,

then an "intercept azimuth" must be established. The necessity for an intercept azimuth to a landing site is determined by the site commander at the particular site, and the required information is relayed to the flight leader as part of the landing instructions. The intercept point should be far enough away from touchdown so as to allow aircraft in formation a long final approach. If required, visual steering commands are given to the flight leaders from the landing site. To preclude a flight missing the landing site, the flight may be given information to proceed along the intercept azimuth for a time period and then turn to the landing site azimuth. The time interval may vary depending upon the speed of the flight.

26. Operation of the Helicopter Landing Zone

a. Helicopters approach the landing zone along a designated flight route. They are normally organized into serials containing two or more flights. One serial may contain a flight for each helicopter. Subsequent flights or serials follow at time intervals which will allow CC personnel and pathfinders at the helicopter sites to properly control landings. Landings of successive flights at one helicopter site should be separated by a minimum of 1 minute in daylight and 2 minutes at night.

b. As each helicopter serial reaches the communication checkpoint on the flight route, the flight leaders initiate communication with the landing sites. The landing site then furnishes the flight with information concerning the vector, enemy situation, wind direction and velocity, landing site azimuth, field elevation, landing direction, landing formation, landing clearance, and any other information required. Radio messages between the landing site and a flight, with all aviators monitoring, might be as follows:

<i>Speaker</i>	<i>Topic</i>	<i>Message</i>
Flight leader.....	Identification, location.....	HOTEL CONTROL, THIS IS HAWK WITH A FLIGHT OF EIGHT IROQUOIS AT THE COMMUNICATION CHECKPOINT, OVER.
Pathfinder at landing site...	Acknowledgment.....	HAWK, THIS IS HOTEL CONTROL;
	Vector from communication checkpoint to RP.	VECTOR, TWO EIGHT ZERO;
	Enemy situation.....	ENEMY MACHINEGUN 500 METERS SOUTH OF LANDING SITE YELLOW;
	Wind direction, velocity.....	WIND NORTHWEST AT ONE FIVE;
	Landing site azimuth (from RP to helicopter site).	SITE AZIMUTH TWO NINE ZERO;
	Field elevation.....	FIELD ELEVATION, SIX TWO ZERO;
	Landing azimuth.....	LAND TWO EIGHT ZERO;
Flight leader.....	Landing formation.....	LAND TACTICAL HEAVY-LEFT, SECTIONS IN TRAIL;
	Final clearance.....	CLEAR TO LAND, OVER.
	Acknowledgment.....	THIS IS HAWK; ROGER; OUT.

c. The helicopter site uses the pathfinder internal net radio to inform the CC that a flight is approaching. The site commander will display navigational aids or take other appropriate action.

d. The helicopter formation continues along the flight route to the RP. Aviators are assisted by the electronic and visual navigational aids of the RP. All helicopters pass over or near the RP, and each flight moves directly to its assigned landing site. The landing site furnishes assistance to any flight which cannot locate its site.

- (1) For a daylight operation, a specified smoke color may be assigned to each helicopter site to aid identification. Since the number of smoke colors is limited, the same color may have to be used by more than one helicopter site. Sites that use the same color should be located farthest apart.

- (a) When smoke is used, care must be taken to avoid starting fires or masking the landing points.

- (b) Smoke should be employed sparingly because it distinctly marks a location not only for friendly forces, but for enemy observers as well. Generally, smoke is used only in response to an aviator's request for help in identifying his helicopter site.

- (2) For a night operation, pyrotechnics are used instead of smoke. Red signals should be used only to mean DO NOT LAND or to indicate other emergency conditions. Emergency codes should be included in SOI's.

e. Each flight lands at its assigned helicopter site in the manner indicated by messages and visual aids displayed.

f. Pathfinders may use arm-and-hand signals (FM 21-60) to help control landings in day or night operations (baton flashlights are used at night).

CHAPTER 6

AIRPLANE LANDING ZONES

27. General

An airplane landing zone has one or more landing strips. A landing strip may have a parking area, a taxiway, and a dispersal area.

28. Detachment Organization and Duties

To operate an airplane landing zone, the pathfinder detachment is organized into two basic parties: the control center (CC) party; and parking party.

a. Control Center and Release Point. A control center is required at each landing strip. If a pathfinder detachment operates more than one strip, the pathfinder detachment commander is located at the most important strip. An RP is not required; however, one may be used if the detachment operates more than one landing facility. The CC and RP are organized and operated as described in chapter 4.

b. Parking Party. The parking party reconnoiters, prepares, and marks the landing strip, taxiways, parking areas, and dispersal areas. It provides parking and taxi signals for each airplane and maintains ground communication with the CC. Using visual aids, it marks the initial assembly points for troops, and furnishes limited security. The basic organization of the parking party includes—

- (1) *The parking party commander* who directs the reconnaissance, preparation, and marking of the landing strip, taxiways, and individual parking and dispersal points for each airplane. He controls the parking and taxiing of airplanes; initial assembly of troops, equipment, and supplies; and furnishes information to the CC.
- (2) *Signalmen* who aid in emplacing and operating visual navigational aids and control the movement of aircraft on the ground.
- (3) *Additional personnel* who may be attached to the parking party, as required, to—

- (a) Assist in the unloading and initial assembly of troops, equipment, and supplies, and to operate assembly aids as directed by the parking party commander.
- (b) Assist in preparing runways, taxiways, parking areas, and assembly points by removing or marking obstacles.
- (c) Defend the area against attack and render other assistance as directed.

29. Selection of Airplane Landing Facilities

a. Landing Strip. Factors involved in the selection of aircraft landing facilities are discussed in detail in TM 5-330.

- (1) The surfaces of a landing strip must be smooth enough to permit aircraft to take off and land without damage, and the ground must be firm enough to permit loaded planes to land, taxi, and take off without bogging down.
- (2) The minimum length and width requirements of a landing strip depend upon the type of aircraft used, the types of loads, the direction and velocity of the wind, and the condition of the ground. Aviation unit and pathfinder detachment commanders coordinate with each other to determine the minimum dimensions of a landing strip. The final decision rests with the aviation unit commander. The following factors affect the required dimensions:
 - (a) A longer landing strip is needed on soft ground than on hard ground.
 - (b) Uphill takeoffs and downhill landings require longer landing strips.
 - (c) Crosswinds during takeoff and landing are hazardous and require compensatory increases in landing strip length and width.
 - (d) The required takeoff distance increases as the mean air density decreases.
 - (e) When facilities or available time do not permit removal of obstacles from the

approach and departure paths, the sacrifice in usable length of the strip must be considered.

b. *Taxiways.* Taxiways should be prepared on one or both sides of the landing strip so planes can clear the strip immediately after landing. Taxiways must be wide enough to permit the largest aircraft being used to taxi from the departure end of the landing strip to the parking area, then to the approach end of the landing strip, yet leave the landing strip clear for other landings or takeoffs.

c. *Parking Areas and Points.*

- (1) Parking areas are selected where aircraft can load or unload equipment, supplies, or personnel in accordance with a pre-arranged plan without interfering with the continuous operation of the landing strip. More than one parking area may be needed to provide enough parking points to support the tactical plan. Helicopters should not be permitted to fly or taxi within 50 meters of parked airplanes.
- (2) The exact locations of parking points depend upon ground conditions, obstacles, number and types of aircraft, types of loads, and the tactical plan including dispersion requirements. The points should be located where aircraft can enter and leave without delay. Alternate points should be selected as time permits.

d. *Dispersal Areas.* Dispersal areas are used to park disabled aircraft and other aircraft scheduled to remain in the area. Dispersal areas should afford concealment from ground and air observation and, where possible, should have ground masks between aircraft. More than one dispersal area may be needed to provide the required aircraft dispersion.

30. Establishment of Airplane Landing Facilities

a. *Landing Strip.*

- (1) The pathfinder internal net radios are prepared for operation immediately upon landing. Operators carry their radios at all times in order to maintain constant communication with the CC.
- (2) The parking party reconnoiters the area as soon as it arrives. Following this, the pathfinder commander selects and points out to the parking party the exact landing

strip to be used. He designates the center of the long axis or one of the sides of the runway by means of an azimuth or a terrain feature. The parking party then marks the landing strip with visual aids. For day operations, the strip is marked with signal panels; for night operations, it is marked with lanterns (fig. 6). Generally, marking tasks can be performed simultaneously. If a marking priority is required, it is established in this order: left side, right side, departure end, and approach end.

- (3) Concurrently with marking, the parking party makes hasty improvements by filling holes or removing brush on the landing strip. It also removes or marks obstacles in the approach and departure paths as promptly as possible.
- (4) All pathfinders should be careful not to create obstacles in the erection of antennas and the construction of field fortifications. They should keep equipment clear of the landing strip so it will not obstruct approach and departure paths or distract the aviators.

b. *Taxiways, Parking Areas, and Dispersal Areas.* The taxiways, parking areas, and dispersal areas are prepared in locations designated by the pathfinder detachment commander. The parking party may prepare these areas simultaneously with preparation of the landing strip. It removes or marks obstacles and continues to improve the facilities as long as necessary.

- (1) Since aviator seats are on the left side of aircraft, the left edge of the taxiway is outlined with panels (lanterns) which should face aviators as they taxi their aircraft.
- (2) A parking point for each aircraft may be marked with a panel (lantern). The aviator should park his aircraft to the right of his panel (lantern) and within wing length of it. Parking arrangements should be preplanned and coordinated.

31. Operation of an Airplane Landing Zone

a. *General.*

- (1) The CC pathfinder internal net operator records flight arrival and departure times and the types of loads brought in or

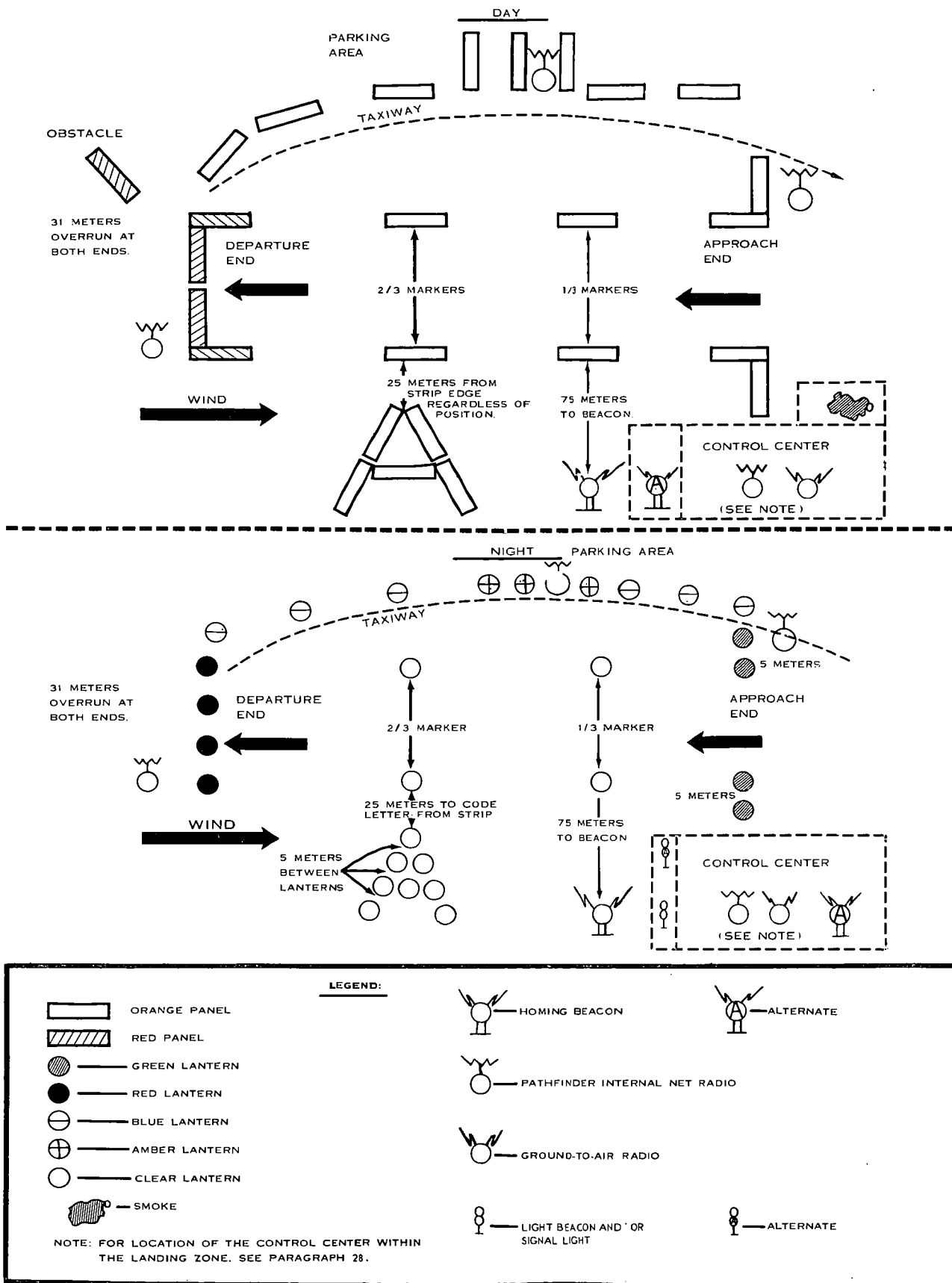


Figure 6. Airplane landing zone.

evacuated. The radio operator in the parking area transmits the load data to the CC.

- (2) Landings and takeoffs by large numbers of aircraft present difficult control problems for pathfinders. Radio discipline must be strictly observed to prevent interference with the exchange of messages between the CC and flight leaders. The CC must exercise the necessary control over aviators and signalmen; but, in doing so, it must avoid transmissions of unnecessary and confusing radio messages.

b. Approach.

- (1) Aircraft, formed as flights, approach the landing strip along a designated flight route. Succeeding flights follow at time intervals based upon the availability of parking space and the time required to land and clear the landing strip. Individual aircraft landings are separated by a

minimum of 30 seconds during day and 1 minute during night operations. When departures are interspersed with landings, arriving aircraft should land at intervals separated by a minimum of 2 minutes.

- (2) As each flight reaches the communication checkpoint, the flight leader initiates communication with the CC by stating the flight's location and number of aircraft. The CC then provides the aviators with information on the enemy situation, wind direction and velocity, field elevation, direction of landing, traffic pattern (fig. 7), and other matters as necessary. The flight leader acknowledges the message and, if not preplanned, assigns the landing order of aircraft within the flight. He issues other instructions to aviators as necessary. Radio messages between the CC and the flight leader (all monitoring) might be as follows:

<i>Speaker</i>	<i>Topic</i>	<i>Message</i>
Flight leader.....	Identification, location.....	PATHFINDER, THIS IS HAWK ONE AT COMMUNICATION CHECKPOINT; SIX CARIBOU; OVER.
Pathfinder at drop and/or landing zone.	Acknowledgment.....	HAWK ONE, THIS IS PATHFINDER; VECTOR, ONE FIVE ZERO;
	Vector from control point to landing strip or RP, as applicable.	
	Interval desired.....	30 SECOND INTERVAL;
	Enemy situation.....	ENEMY MACHINEGUN 400 METERS WEST OF STRIP;
	Wind direction, velocity.....	WIND WEST AT ONE FIVE;
	Land direction.....	LAND, TWO SIX ZERO;
	Traffic pattern (given only when traffic is not left-hand).	TRAFFIC PATTERN (RIGHT) (STRAIGHT IN);
	Condition of runway.....	RUNWAY, SOD;
	Field elevation and other information, i.e., length and width.	ELEVATION SIX FIVE ZERO;
	Call base.....	CALL BASE; OVER (This instruction tells the flight leader to notify the CC when he commences his turn to base leg).
Flight leader.....	Confirmation.....	THIS IS HAWK ONE; ROGER, OUT.

- (3) The pathfinder internal net radio operator at the CC informs the parking party that a flight is approaching.
- (4) The flight formation continues along the flight route to the landing strip (via the RP, if required). If an aircraft or flight cannot locate the landing strip, the CC furnishes additional assistance on request.

When the flight is within sight of the landing strip, it breaks into a tactical landing or other prearranged formation. Each pilot notifies the CC when his aircraft commences its turn to base leg. Messages transmitted might be as follows:

Speaker	Topic	Message
Flight leader.....	Location.....	PATHFINDER, THIS IS HAWK ONE; TURNING BASE; OVER.
Pathfinder at drop and/or landing zone.	Acknowledgment.....	HAWK ONE, THIS IS PATHFINDER.
	Clearance.....	CLEAR TO LAND.
	Parking instruction.....	RIGHT TURN DEPARTURE END OF STRIP; OVER.
Flight leader.....	Confirmation.....	THIS IS HAWK ONE; RIGHT TURN; OUT.

c. Landing. Each aircraft lands as directed by the CC and the displayed visual aids.

- (1) Visual signals are used in accordance with prearranged plans to assist aviators in routine landings and in emergency situations. If ground-to-air communication fails, landings and takeoffs are controlled by means of visual signals and aids.
- (2) Care must be taken not to blind the aviators with smoke nor confuse them with unnecessary or unusual signals.
- (3) If a dangerous landing situation arises, the pathfinder detachment commander should keep the aircraft in the air until the landing can be accomplished. He instructs the aviators by ground-to-air radio or emergency visual signals.

d. Parking. As each aircraft touches down, the parking party assumes control.

- (1) A signalman guides the aviator from the landing strip to the taxiway. The aviator then taxis to the parking area by guid-

ing on the visual aids displayed. On exceptionally poor or unmarked taxiways, it may be necessary for a signalman to lead each aircraft to its parking area.

- (2) As each aircraft enters the parking area, a signalman directs it to its designated parking point.
- (3) All parking, taxi, and arm-and-hand signals (FM 21-60) must be clearly visible (at night, baton flashlights are used) and understandable to aviators. These signals are given from the left side of aircraft. Signalmen must be positioned far enough from the planes to be in view of the aviators.
- (4) When an aircraft has parked, supporting unit personnel attached to the pathfinder detachment take charge of the unloading and initial assembly of the transported troops, equipment, and supplies. Movement and assembly must be performed rapidly and in such a manner that the

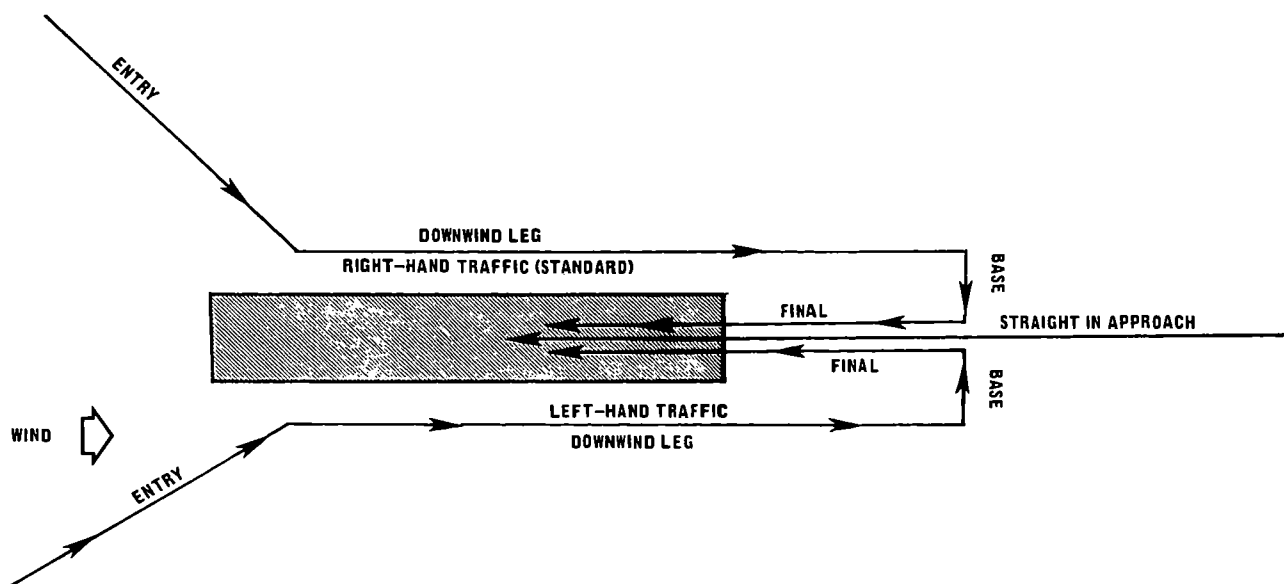


Figure 7. Air traffic patterns.

landing strip, taxiways, or parking points will not be blocked. Movement across the landing strip is not permitted without specific approval of the CC.

- (5) Disabled aircraft and aircraft unable to leave on schedule are moved to a dispersal area.

e. Departing. When aircraft are ready to depart, the parking party internal net radio operator notifies the CC. A departure may be made in a full flight formation, in a portion of a flight for-

mation, or by individual aircraft depending upon the plan and the existing situation. A signalman guides the aircraft out of the parking area and onto the taxiway in the order designated by the CC. A signalman on the taxiway keeps the aircraft there until the runway is clear. The aircraft are then released one at a time as follows: the CC gives each aviator clearance through the ground-to-air radio and the signal light. The signalman then releases the aviator to enter the runway. Message sequence should be as follows:

<i>Speaker</i>	<i>Topic</i>	<i>Message</i>
Pathfinder at CC.....	Identification.....	HAWK ONE, THIS IS PATHFINDER; WIND
	Wind reading (if wind has changed).	WEST AT EIGHT; CLEAR TO TAXI;
	Taxi instructions (if aircraft is a long distance from active strip).	
Flight leader.....	Confirmation.....	WIND WEST AT EIGHT; OUT.
Pathfinder at CC.....	Clearance.....	HAWK ONE, THIS IS PATHFINDER; CLEAR FOR TAKEOFF.

CHAPTER 7

DROP ZONES

32. General

A drop zone is a specified location where troops or material are air-delivered. It has a CC and one or more drop sites. The CC may be established at or near the code letter location, and the CC party may assume the duties of the marketing party. If two drop sites are established, each must have a CC, with the pathfinder command post located at the most critical drop site. Normally, when only one drop site is used, an RP is not employed; but when a single drop site is operated in conjunction with any number of helicopter sites, employment of an RP is desirable for the helicopter sites only (fig. 1).

33. Detachment Organization and Duties

a. The pathfinder detachment at a drop zone is organized into a CC party and a DZ party. The DZ party is further subdivided into a marketing party, a flank party, and a far party. The marketing party prepares and places the panels (lanterns) that form the code letter; the flank and far parties position the flank panel (lantern) and far panel (lantern and light beacon or signal light), respectively (fig. 8), and provide limited security.

b. The CC and RP are organized and operated as described in chapter 4.

34. Selection of a Drop Zone

a. A drop zone is located where it can best support the tactical plan. Factors to be considered in its selection are the—

- (1) Type aircraft to be employed.
- (2) Altitude at which air-delivery is to be made.
- (3) Aircraft formation for air-delivery.
- (4) Types of loads to be delivered.
- (5) Relative number of obstacles in the area.
- (6) Availability of adequate aircraft approach and departure routes.
- (7) Method of airdrop, i.e., free fall, high velocity, or low velocity.
- (8) Access to the area.

b. The required length of a drop zone can be computed by using the ground speed of the aircraft and the time needed to release its cargo. The formula is D equals RT , in which D is the zone length (distance) in meters, R is the ground speed (rate) of the aircraft in meters per second, and T is the time required for an aircraft to release its cargo. To use this formula, air speed (expressed in knots) must first be converted to ground speed (expressed in meters) per second.

Note. When the wind velocity at the delivery altitude cannot be determined, use the aircraft's air speed as the ground speed.

- (1) To compute the ground speed when an aircraft is flying into a headwind, subtract the velocity of the headwind from the air speed. For example, an aircraft flying into a 10-knot headwind at an indicated air speed of 110 knots will have a ground speed of 100 knots. To compute the ground speed when an aircraft is flying with a tailwind, add the velocity of the tailwind to the air speed. For example, a 10-knot tailwind plus a 110-knot air speed gives a ground speed of 120 knots.

Note. It is desirable to fly aircraft into the wind during air-delivery because the slower ground speed gives more time over the zone and assures a more compact ground pattern.

- (2) To convert knots to meters per second, use this equation: 1 knot equals 0.51 meters per second. Thus, a ground speed of 100 knots equals 0.51×100 equals 51 meters per second.
- (3) To calculate the required length of a DZ by using the formula D equals RT and applying the conversions described in (1) and (2) above, proceed as in this example: An aircraft is flying at a ground speed of 90 knots, and its cargo can be released in 8 seconds.

What is the required length of the DZ?

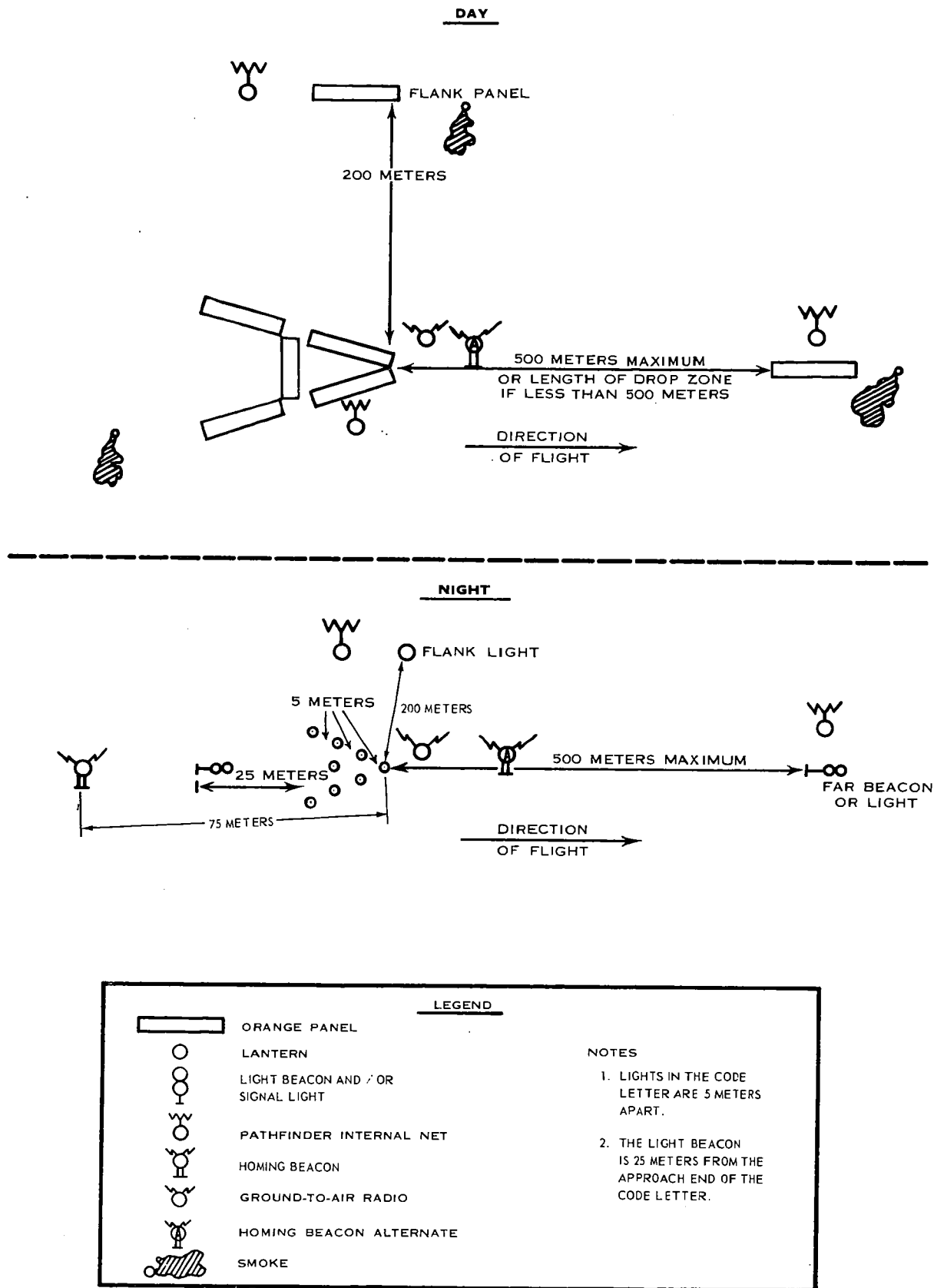


Figure 8. Drop zone.

R equals 45.9 meters per second (0.51×90 equals 45.9).

T equals 8 seconds.

D equals 45.9×8 equals 367.2 meters (rounded off to 368 M).

c. If a DZ of the desired length is not available, the flight time over the zone (whatever its length) must be computed to determine how much of the load can be released in one pass and/or how many passes must be made to release the entire load. This formula is used: T equals D/R , in which T is the time over the DZ , D is the length (distance) of the DZ , and R is the ground speed (rate). For example, a field 150 meters long is available as a DZ , and an aircraft can release its load at a ground speed of 105 knots or 54 meters per second (0.51×105 equals 53.55 or 54). Applying the formula T equals D/R , $150 \div 54$ equals 2.7 seconds (time over the DZ).

d. The required width of the DZ depends upon the method and/or type of airdrop, wind drift, and formation of the aircraft. Usually the minimum width of the drop zone will be dictated by the relative location of the code letter and the desired impact point.

35. Location of Code Letter

a. *General.* The location of the code letter depends upon the size and shape of the DZ ; the formation, ground speed, and altitude of the aircraft over the DZ ; the number of containers to be delivered and the time required to drop them; and the drift of parachuted loads which, in turn, depends upon the direction and velocity of the wind. The code letter is alined with the long axis of the DZ or on a prearranged azimuth. The aircraft fly over the code letter and begin releasing their loads as they come on line with the flank panel.

b. *Wind Drift Formula.* The wind drift formula, D equals KAV , is used to determine the amount of drift of parachutes (in meters) from a given altitude. In this formula, K is a constant that represents the characteristic drift of a parachute of a certain model (for T-10 parachutes, K is 4.1; for all other parachutes, K is 2.6), A is the altitude of the aircraft (in hundreds of feet) over the DZ , and V is the ground velocity (in knots) of the wind.

- (1) An anemometer can be used to measure wind velocity. Some anemometers give readings in knots, and others in miles per hour. Miles per hour is divided by 1.15

to convert to knots, but, for practical purposes, the direct substitution of miles per hour for knots in the wind drift formula gives sufficiently accurate results for winds below 10 knots.

- (2) Since each pathfinder will not always have an anemometer available, he must be able to estimate wind velocity with acceptable accuracy. Pathfinders can learn to do this during training by observing the effect of winds of varying strengths on grass, dust, bushes, or small pieces of paper, and then comparing these effects with those associated with anemometer readings. (For expedient methods of determining wind velocities, see FM 23-71.)
- (3) To illustrate how the wind drift formula D equals KAV is applied, assume that G-13 parachutes are used to drop cargo from an altitude of 500 feet in a 10-knot wind. Then, $2.6 \times 5 \times 10$ equals 130 meters of drift.

36. Establishment of a Drop Zone

a. *Day Drop Zone* (fig. 7).

- (1) The pathfinder CO selects the exact location for the code letter. He then has the code letter alined on the predesignated heading which he desires the aircraft to fly. The XO supervises the placement of the code letter.
 - (a) The marking party places the code letter on the ground as shown in figure 8.
 - (b) The flank party places a flank panel parallel to the code letter, alining the center of the panel with the top of the code letter. The flank panel is placed at a distance of 200 meters from the left edge of the code letter.
 - (c) The far party places a panel at the far end of the DZ , erecting it vertically on a tree or bush so that the long axis is in line with the desired line of flight, is in line with the code letter, and is positioned at a maximum distance of 500 meters or the length of the drop zone, whichever is less.
- (2) Concurrently, the CC party prepares the ground-to-air radio and electronic homing beacons for operation. All electronic aids must be sufficiently dispersed to pre-

vent mutual electronic interference or simultaneous loss by enemy fire.

b. Night Drop Zone (fig. 8). The procedure for establishing a night DZ is the same as for a day DZ except that either infrared or incandescent lights are used to mark the code letter, the flank, and the far end. The interval between lights in the code letter is 5 meters. One light beacon and/or signal light is placed 25 meters from the code letter on the approach end, and another is placed at the far light.

c. Detecting DZ's. In heavily vegetated terrain, DZ's are difficult to locate from the air. Expedient methods such as the use of balloons, pyrotechnics, and signal pistols may be used effectively when operating on such terrain.

37. Operation of a Drop Zone

a. As each flight reaches the communication checkpoint, the flight or serial leader informs the CC and includes additional information (as necessary) concerning the number and type(s) of aircraft and types of loads. The CC provides the aviators with information on the magnetic heading (vector) from the communication checkpoint to either the DZ or the RP, the enemy situation, aircraft formation and drop altitude (indicated), map elevation of the highest point of the DZ, and any other matters as necessary. The pathfinder in command must carefully examine the map of the area and the actual topographical surroundings in the zone to insure that there are no obstacles in the flight path on either the approach or immediate departure route. The altitude (indicated) prescribed for the aviators by the CC must be high enough to guarantee adequate clearance of all obstacles in the flight path. The flight leader acknowledges receipt of the message and complies with the instructions received.

b. As the lead aircraft comes into view, the CC gives the aviator verbal instructions to guide him over the code letter, alerts him as he nears it, and tells him when to release his load. Training aircraft or other aircraft in the same formation follow the movements of the lead aircraft as closely as possible and listen for corrective instructions from the CC. The CC prefaces individual instructions with the call sign of the aircraft concerned.

c. In an extremely restricted DZ, it may be necessary for each aircraft to make several passes over it, releasing a part of its load on each pass

(para 34c). On such a DZ, the best formation is single aircraft in trail. The CC has the flight fly over the DZ in a continuous circle, using either a right- or left-hand traffic pattern. Since the aviators of aircraft in trail can usually follow the lead aircraft quite accurately, the CC seldom has to give them individual instructions until each aircraft is in position to drop its load.

d. Aircraft in Vee formation are not as maneuverable as single aircraft in trail. For this reason, pathfinders must anticipate the additional space required by aviators of such aircraft to complete the corrective maneuvers, and the CC must give instructions for turns while the aircraft are still far enough away for the aviators to make gradual directional changes.

38. Examples of Pathfinder Guidance Procedure

a. General.

- (1) When the aircraft come into view of the CC pathfinder, he must keep them under constant observation in order to guide them correctly over the DZ. The aircraft must be flying high enough to give the pathfinder a continuous line of sight to them. The pathfinder may have to instruct the aviators to change altitude to insure this.
- (2) Initially, the pathfinder gives instructions only to the serial or flight leader, but all aviators in the serial or flight monitor the messages and imitate the action of their leader. When the pathfinder needs to give instructions to individual aviators, he prefaces his instructions with the call sign of the aircraft concerned.
- (3) If ground-to-air radio communication fails while the CC is providing guidance, all aviators continue their missions, using visual aids on the ground to assist in making the correct approach. In such situations, the aviator will align the aircraft with the code letter and the far panel. As the left wing comes abeam of the flank panel, the aviator will release the load. If the CC determines that a "no-drop" condition exists, the CC will direct one or more of the following actions:
 - (a) Display red side of panels.
 - (b) Display no visual aids.

(c) Use precoordinated visual signals, to include pyrotechnics and lights.

b. *Guidance for a Drop in Trail.* Guidance communication for a drop in trail might be as follows:

Flight leader: PATHFINDER, THIS IS HAWK ONE WITH SIX CARIBOU AT COMMUNICATION CHECKPOINT; OVER.

Pathfinder: HAWK ONE, THIS IS PATHFINDER; VECTOR, ZERO FOUR FIVE; ENEMY MACHINE GUN 400 METERS WEST OF DZ; DROP IN TRAIL AT FIVE HUNDRED INDICATED: MAINTAIN FIVE HUNDRED (number of feet) UNTIL I HAVE YOU IN SIGHT; OVER.

Flight leader: THIS IS HAWK ONE, ROGER, OUT.

Pathfinder: (Later, to change flight altitude) HAWK ONE, THIS IS PATHFINDER, DESCEND TO FOUR HUNDRED INDICATED; OVER.

Flight leader: THIS IS HAWK ONE, ROGER; OUT.

c. *Guidance for a Drop in Vees.* Guidance communication for a drop in Vees might be as follows:

Flight leader: PATHFINDER, THIS IS DOVE ONE WITH SIX CARIBOU AT COMMUNICATION CHECKPOINT, OVER.

Pathfinder: DOVE ONE, THIS IS PATHFINDER; VECTOR, ZERO SIX ZERO; ENEMY SITUATION NEGATIVE; DROP IN VEES AT FIVE HUNDRED INDICATED; OVER.

Flight leader: THIS IS DOVE; ROGER; OUT.

As the lead Vee comes into sight, the pathfinder guides it toward the code letter with the second Vee following. When he first sights the lead aircraft, he may have to give instructions such as the following:

Pathfinder: DOVE ONE, STEER RIGHT. The flight leader responds by performing the action directed by the pathfinder. When the

flight leader is on the desired course, the pathfinder informs him:

Pathfinder: DOVE ONE, ON COURSE.

The flight leader straightens out to fly on the heading indicated at the time the pathfinder announces "ON COURSE." Since all aircraft should change direction *gradually*, the pathfinder must begin giving his instructions before the aircraft reaches the point of change. If, however, an abrupt turn is necessary, the pathfinder stresses the need as follows:

Pathfinder: DOVE ONE, STEER HARD LEFT.

The flight leader turns as sharply as safety considerations permit and continues in this direction until the pathfinder gives his next instruction as follows:

Pathfinder: DOVE ONE, ON COURSE.

(He alerts the flight leader as he nears the code letter.) DOVE ONE, STAND BY. (The flight leader prepares to execute air delivery. As he passes over the code letter, the pathfinder instructs him to start air delivery.) DOVE ONE, EXECUTE! EXECUTE! EXECUTE! (The flight leader, followed by all other aircraft in his formation, executes the air delivery. He maintains his heading until he clears the DZ. He then leads his flight formation to the control point and/or the departure airfield. Should the aircraft veer off the desired course during the drop, further steering correction commands can be given.)

If the pathfinder sees that an aircraft is not in correct position to make the air delivery, he must warn the aviator and instruct him further:

Pathfinder: DOVE TWO, NO DROP! NO DROP! NO DROP!

Dove Two: DOVE TWO, NO DROP.

Pathfinder: DOVE TWO, MAKE RIGHT TURN, FOLLOW DOVE SIX.

Dove Two makes a right turn and follows the last aircraft in the flight to make a second pass over the DZ. The command to execute is repeated until the drop commences, unless conditions preclude making the drop.

CHAPTER 8

LOW LEVEL EXTRACTION (LOLEX) ZONES

39. General

A low level extraction (LOLEX) zone is an area where material can be delivered from aircraft at an altitude of 15 feet or less by means of an extraction parachute attached to a pallet.

40. Detachment Organization and Duties

To operate a LOLEX zone, the pathfinder detachment is organized into two basic parties—the CC party; and the marking party. When more than one site is being operated within a single LOLEX zone, it may be necessary to establish an RP.

a. Control Center and Release Point. A control center is required at each LOLEX site. If a pathfinder detachment operates more than one site, the pathfinder detachment commander is located at the most important site. The control center and RP are organized and operated as described in chapter 4.

b. Marking Party. The marking party reconnoiters, prepares, and marks the LOLEX site with panels as shown in figure 9. The marking party also provides limited security, prepares smoke for use, and marks obstacles on the approach and departure ends of the LOLEX site.

41. Selection of a LOLEX Zone

a. A LOLEX zone is located where it can best support the ground tactical plan. Factors to be considered in its selection are—

- (1) Type aircraft to be used (normally CV-2).
- (2) Type of loads to be delivered.
- (3) Type of extraction parachute to be used.
- (4) Relative number of unremovable obstacles in the area.
- (5) Required length and width of extraction area.
- (6) Availability of adequate aircraft approach and departure routes.
- (7) Access to the area.
- (8) Personnel and facilities available for clearing delivered pallets from the site.

b. The required length of an extraction site should be coordinated with the aviation unit concerned. Normally, the required length to complete an extraction is 200 meters. If possible, the extraction site should be alined to execute the extraction into the wind.

42. Establishment of a LOLEX Zone

a. Day LOLEX Zone.

- (1) The pathfinder control net, radios, and homing beacons are prepared for operation immediately upon landing. Operators carry the radios at all times in order to maintain constant communication with the CC.
- (2) The marking party reconnoiters as soon as it arrives. Following this, the site commander selects the location of the execution point and designates the line of flight by means of an azimuth or a terrain feature.
- (3) The marking party alines the panels on the designated line of flight and provides holes for emplacement of smoke.
- (4) Concurrently with marking the LOLEX site, the marking party marks or removes obstacles on the approach and departure ends.
- (5) Because of the extreme low level flight of the aircraft, pathfinders should insure that antennas and other equipment do not present a hazard to the incoming aircraft. Equipment should be kept clear of the LOLEX site so it will not obstruct departure and approach lines of flight or distract the aviators.

b. Night LOLEX Zone. At this time a safe method of conducting LOLEX operations at night has not been developed. Several procedures are currently under study by appropriate agencies.

43. Operation of a LOLEX Site

a. Guidance instructions and air traffic control procedures are practically identical for LOLEX

and paradrop operations. The main differences are—delivery aircraft must be checked to insure that landing gear is down; and vertical steering commands may be required to bring the aircraft cargo compartment to within the required distance above the ground for correct delivery.

b. If facilities or personnel are not available to remove pallets from the delivery area between passes, the CC will direct succeeding approaches to insure that low passes and extraction are not made over previously delivered pallets.

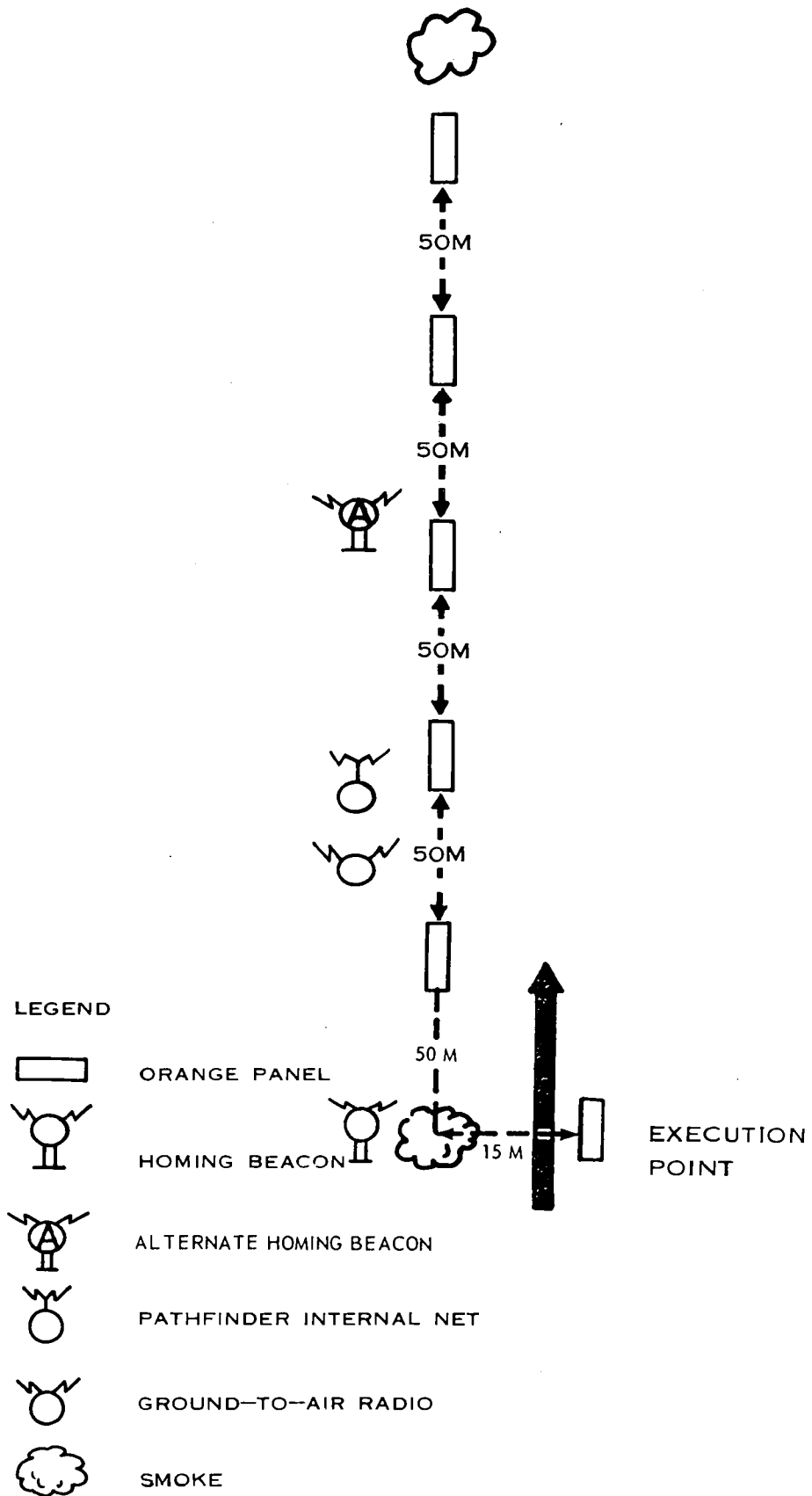


Figure 9. LOLEX zone.

APPENDIX I

REFERENCES

ACP 168-(B)	Pyrotechnic Signals.
AR 95-13	Safety Procedures for Operation and Movement of Army Aircraft on the Ground.
AR 320-5	Dictionary of United States Army Terms.
AR 320-50	Authorized Abbreviations and Brevity Codes.
DA Pam 108-1	Index of Army Motion Pictures, Filmstrips, Slides, Tapes and Phonorecordings.
DA Pam 310-3	Military Publications: Index of Doctrinal, Training, and Organizational Publications.
FM 1-5	Army Aviation Organization and Employment.
FM 1-15	Aviation Battalion.
FM 1-100	Army Aviation.
FM 5-15	Field Fortifications.
FM 5-25	Explosives and Demolitions.
FM 7-15	Rifle Platoon and Squads Infantry, Airborne and Mechanized.
FM 7-20	Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
FM 7-24	Communication in Infantry and Airborne Divisions.
FM 7-30	Infantry, Airborne, and Mechanized Division Brigades.
FM 17-36	Divisional Armored and Air Cavalry Units.
FM 20-32	Land Mine Warfare.
FM 21-5	Military Training Management.
FM 21-6	Techniques of Military Instruction.
FM 21-26	Map Reading.
FM 21-30	Military Symbols.
FM 21-31	Topographic Symbols.
FM 21-40	Small Unit Procedures in Chemical, Biological, and Radiological (CBR) Operations.
FM 21-41	Soldier's Handbook for Chemical and Biological Operations and Nuclear Warfare.
FM 21-60	Visual Signals.
FM 21-75	Combat Training of the Individual Soldier and Patrolling.
FM 24-18	Field Radio Techniques.
FM 31-11	Doctrine for Amphibious Operations.
FM 31-12	Army Forces in Amphibious Operations (The Army Landing Force).
FM 31-13	Battle Group Landing Team (Amphibious).
FM 31-21	Special Forces Operations.
(CM) FM 32-5	Communications Security (U).
FM 57-10	Army Forces in Joint Airborne Operations.
FM 57-35	Airmobile Operations.
FM 57-100	The Airborne Division.
FM 61-100	The Division.
TM 3-210	Fallout Prediction.
TM 5-330	Planning, Site Selection, and Design of Roads, Airfields, and Heliports in the Theater of Operations.

TM 9-1370-200	Military Pyrotechnics.
TM 10-500-Series	Air Drop of Supplies and Equipment.
TM 11-287	Radio Sets AN/VRQ-1, AN/VRQ-2, and AN/VRQ-3.
TM 11-5020	Antenna Equipment RC-292.
TM 11-5820-292-10	Operator's Manual: Radio Sets AN/PRC-8, -8A, -9, -9A, -10, -10A, and -28.
TM 11-5820-292-20	Organizational Maintenance Manual: Radio Sets AN/PRC-8, -8A, -9, -9A, -10, -10A, and -28.
TM 11-5820-401-10	Operator's Manual: Radio Sets AN/VRC-12 and AN/VRC-43, -44, -45, -46, -47, -48, and -49.
TM 57-210	Air Movement of Troops and Equipment.
TM 57-220	Technical Training of Parachutists.

APPENDIX II

OPERATION FORMATS

1. General

The formats described here are used to facilitate organization of the pathfinder detachment for operations, and to maintain an accurate record of personnel and material delivered and evacuated during an operation. These formats are intended as a guide and may be modified as required.

2. Operation Planning Format

(fig. 10)

a. Purpose. This format is used by the detachment commander in organizing his unit for an operation. It consolidates information pertinent to each individual and can be used as a reference by the commander during his planning and briefing for an operation.

b. Explanation of Headings.

- (1) *Plane number.* The chalk number or the last three digits of the serial number of the aircraft in which the individual will be transported.
- (2) *Exit number.* The order in which the pathfinders will leave the aircraft.
- (3) *Name.* The name of the pathfinder.
- (4) *Position in chain of command.* A number indicating the relative order of rank within the detachment (or within teams) if widely dispersed (i.e., for a helicopter landing zone operation).
- (5) *Duty and location.* The job assignment and location within the landing area for each pathfinder.
- (6) *Call sign and frequency.* The radio call sign and frequency for those individuals operating radios.
- (7) *Equipment.* Equipment, other than individual equipment, that each pathfinder will carry for an operation.

3. Landing and/or Drop Zone Control Records

(fig. 11)

a. Purpose. This format is used to maintain a record of aircraft arrivals, departures, and loca-

tions in the landing area. It serves as a source of information for both ground and aircraft commanders, aids in accounting for personnel and equipment, and is instrumental in making efficient use of available aircraft. It is normally maintained by the pathfinder internal net radio operator at the CC.

b. Explanation of Headings.

(1) *Date-time group.*

- (a) *Pfdr team.* Coded or numbered designation.
- (b) *Supported unit.* Ground unit designation.
- (c) *Period.* Date and time operation commenced until 2400 hours the following day, or 0001 until 2400 hours.
- (d) *Operation.* Special designation or operation plan number.
- (e) *(Helicopter Site) (Landing Site) (DZ) designation.* Cross out items in parentheses not applicable and add special designation given (if any).
- (f) *Recorder.* Name of person who has recorded data on the form.

(2) *Column headings.*

- (a) *Flight or aircraft number.* Radio call sign of the flight or aircraft.
- (b) *Type aircraft.* Army or Air Force model designation.
- (c) *Time communication established.* Time aircraft acknowledges contact (radio or visual, as applicable).
- (d) *Time.*
 1. *Arrival.* Time aircraft or first of flight sets wheels down.
 2. *Departure.* Time aircraft or last of flight has wheels up.
- (e) *Type load.*
 1. *Delivered.* Type supply or equipment, or number of persons delivered.
 2. *Evacuated.* Type supply or equipment, or number of persons evacuated.

(f) *Destination.* Aircraft destination within the landing area.

(g) *Remarks.* Indicate specific equipment delivered or evacuated, and amounts,

and other pertinent remarks which may assist in correcting communications and field marking techniques for future operations.

PATHFINDER OPERATION PLANNING FORMAT

Plane No.	Exit No.	Name	Position in chain of command	Duty and location	Call sign and frequency	Equipment (all PRC-25 with two batteries)
998	3	Moffitt	1	Det CO CC landing site green.	Ajax 39.0.	1 PRC-25 (Alt Homer).
999	2	Richards	6	Site operator landing site green.	Landing site green 42.3.	1 PRC-25 and 10 green, 5 red smoke.
999	3	Lawson	9	Radiotelephone operator landing site green.	Landing site green 39.0.	6 VS-17 panels, demolition kit.
998	1	Parrish	2	Site commander landing site white.	Nuteake 41.2.	1 PRC-25.
998	2	Strunks	13	Site operator landing site white.	Landing site white 41.2.	1 PRC-25 and 10 white smoke.
999	1	Wright	12	Radiotelephone operator landing site white.	Landing site white 39.0.	5 red smoke and 6 VS-17 panels.
998	4	Larkee	5	Site commander landing site blue.	Naughty 40.0.	1 PRC-25.
999	4	Lanham	11	Site operator landing site blue.	Landing site blue 40.0.	1 PRC-25 and 10 violet smoke.
999	5	Haynie	10	Radiotelephone operator landing site blue.	Landing site blue 39.0.	5 red smoke and 6 VS-17 panels.
998	5	Warner	8	Site commander landing site yellow.	Echo 45.9.	1 PRC-25.
999	6	Seanor	14	Site operator landing site yellow.	Landing site yellow 45.9.	1 PRC-25 and 10 yellow smoke.
999	7	Keen	15	Radiotelephone operator landing site yellow.	Landing site yellow 39.0.	5 red smoke and 6 VS-17 panels.
998	6	Weekly	3	RP commander RP.	Ajax 42.3.	A PRC-25.
998	7	Carden	4	RP operator.	HB 39.0.	Primary homer and 10 yellow smoke.
999	8	Thomas	7	Radiotelephone operator at RP.	RP 39.0.	5 red smoke and 69 VS-17 panels.

Figure 10. Operation planning format.

Pfdr Del	187
Supported Unit	1/29 Inf
Period	210001-212400 May 65
Operation	YELLOW JACKET
(Helicopter Site, Landing Site, DZ)	BRAVO
Designation	
Recorder	SFC G. E. Turner

Flight or Aircraft No.	Type Acft	Time Comm Estab- lished	Time		Type Load		Destination (Helicopter Site, Landing Site, or DZ)	Remarks
			Arr	Dprt	Delivered	Evac		
<i>(Example for Landing Strip Operation)</i>								
Mike 1	CV-2	0600	0620	0625	75 cases rations	2WIA	Alfa White	
Mike 2	CV-2	0600	0620	0625	40 cases rations and <i>ammo</i> , 7.62-mm.	2WIA	Alfa White	Damaged propeller. To dispersal area.
<i>(Example for Landing Strip Operation)</i>								
Mike 3	CV-2	0600	0620	0625	10 cases rations, 3.5-inch RL and <i>ammo</i> , 7.62-mm.	3WIA	Alfa White	
<i>(Example for Drop Zone Operation)</i>								
Red 1	CV-2	1705	1702		7.62-mm ammo linked.		Echo Yellow	
Red 2	CV-2	1705	1720		Unk.		Echo Yellow	Aborted one mile out.
Red 3	CV-2	1705	1720		60 cans water.		Echo Yellow	
3564	CH-34	1720	1740		75 cases rations.		Echo Blue	Four broken cases.
<i>(Example for Helicopter Site Operation)</i>								
Violet 1	CH-34	1215	1225	1226	9 <i>pers</i>		Hotel Green	
Violet 2	CH-34	1215	1225	1226	9 <i>pers</i>		Hotel Green	Radio doesn't receive.
Violet 3	CH-34	1215	1225	1226	¼-ton trk		Hotel Green	
Violet 4	CH-34	1215	1225	1230	9 <i>pers</i>	4WIA	Hotel Green	

Figure 11. Landing and/or drop zone control record (sample extract).

APPENDIX III

CHECKLIST FOR PATHFINDER OPERATION

Upon receipt of an order to execute a pathfinder operation, the pathfinder commander follows, to the extent possible, the following troop leading procedures:

a. Make tentative plan of operation.

- (1) Study map.
- (2) Make a quick estimate of the situation.
- (3) Begin planning.

b. Arrange for—

- (1) Movement of unit (informs second in command).
- (2) Reconnaissance (decide on route, method, schedule, and with whom).
- (3) Issuance of order (select time and place, notify subordinate leaders).
- (4) Coordinate (ground and aviation units).
 - (a) The tactical plan.
 - (b) Air movement plan.
 - (c) Assembly plan and techniques.
 - (d) Determine as much detail as possible.
 1. Loading plan of ground unit.
 2. Landing plan of ground unit.
 3. Study objective area, time and date of landing, and weather to determine—
 - (a) Visibility conditions.
 - (b) Suitability of terrain.
 - (c) Parking, unloading, and departing procedure.
 - (d) Study unit's *SOI*.
- (e) From the above, prepare tentative operational plan for the pathfinder detachment.

(f) Make estimate of—

1. Necessity for additional personnel.
2. Necessity for additional equipment or material.

3. Communications plan.

(g) Issue detachment warning order.

1. A brief statement of the enemy and friendly situation.
2. Mission of the detachment.
3. Individual uniform, equipment, identification, and camouflage measures for each member.
4. Work priority for preparation of detachment equipment.
5. Instructions for obtaining necessary rations, water, ammunition, and special items of equipment.
6. Set time and place for the detachment to receive the operations order.

c. Make reconnaissance (continue estimate, receive recommendations).

d. Complete plan (work out details, formulate orders).

- (1) Present tentative plan to ground unit commander or his staff.
- (2) Prepare final plan based on desires of ground unit commander and his final order.

e. Issue detachment order (app. IV).

f. Join ground unit.

g. Rehearse (if time and terrain permit).

APPENDIX IV

PATHFINDER OPERATION ORDER

1. General

The operation order is usually issued orally; however, the sample operation order below is included as a guide for pathfinder detachment commanders. It does not include all the details which might be given under different situations. The order is prepared for a reinforced pathfinder detachment supporting an airmobile operation. This type operation is used since it will be the most com-

mon operation of pathfinders in support of assault troop movements. In issuing the order, all available aids should be used. Pathfinders must be aware of which units are to be landed at each site in order to prevent confusion. Units should be made aware of the location of their alternate landing site in case it becomes necessary to close a site because of enemy action.

2. Sample Order

(Classification)

Copy No. 1
Pfdr Det 504
Lawson (901817)
Jan 65

OPORD I

REFERENCE:

MAPS: Georgia 1:50,000 Scale, Columbus, Lumpkin sheets

ORGANIZATION: (Annex A)

TIME ZONE: Romeo

1. SITUATION

a. Enemy forces.

- (1) Units in zone estimated 75 percent strength. Reconnaissance platoon has been reported in objective area near Landing Site Green.
- (2) Enemy capable of employing nuclear weapons.
- (3) Indications are that the enemy will defend.

b. Friendly forces.

- (1) 1/87 conducts airmobile assault beginning 081345R Jan 65.
 - (2) 2/7, 2/15, 2/10 Inf on line will attack at H+10 minutes.
 - (3) 2/27 remains in reserve prepared to exploit a breakthrough on the line of contact or reinforce the airhead.
 - (4) 1st HOW BN, 5th ARTY in DIRECT SUPPORT.
 - (5) 6th HOW BN, 43 ARTY in GENERAL SUPPORT.
 - (6) 1st ROCKET HOW BN, 82d ARTY GENERAL SUPPORT with priority of fires to 1/87 Inf.
 - (7) 9th TAF supports atk; priority to 10th INF DIV.
 - (8) 31st TAC TRANS AVN GP will support with aircraft.
- ##### c. Attachments and detachments.

Liaison officer and radio operator.

2. MISSION

Pathfinder Detachment 504 lands in sector by helicopter at H-10 minutes and establishes helicopter landing zone for airmobile assault by 1/87 Inf.

(Classification)

3. EXECUTION

a. Concept of Operation. Pathfinder Detachment 504 lands on assigned operational areas, establishes, and operates landing zone Ajax with four landing sites, release point, and control center at 081325R January 65.

b. Control Center.

- (1) Land at coordinate 059857.
- (2) Establish ground-air, and pathfinder internal communications after navigational aids are emplaced.
- (3) Control and operate LZ from H-hour until relieved.
- (4) Operate landing site green at 059857.

c. Release point.

- (1) Land at coordinates 046821.
- (2) Establish visual and electronic navigation aids on suitable terrain in the immediate vicinity.
- (3) Establish communication with the control center.
- (4) Display smoke only on order from the control center.
- (5) Be prepared to assume the duties of the control center on order.

d. Landing Site Parties.

- (1) Land at the following coordinates as applicable:
 - (a) WHITE—071843
 - (b) YELLOW—045365
 - (c) BLUE—059835
- (2) Conduct reconnaissance, select, and mark landing sites for eight UH-1D helicopters.
- (3) Establish communications with control center and send SOP information.
- (4) Mark troop assembly points.
- (5) Mark obstacles as necessary.

e. Coordinating Instructions.

- (1) H-hour 081345R Jan. 65.
- (2) Tail numbers of UH-1D: 256 and 273.
- (3) Senior pathfinder in each aircraft prepare strip map of flight route.
- (4) Air-movement plan.
 - (a) Control Center: Acft number 256.
 - (b) Release point: Acft number 273.
 - (c) Helicopter site White: Acft number 256.
 - (d) Helicopter site Blue: Acft number 273.
 - (e) Helicopter site Yellow: Acft number 273.
 - (f) Trail information: 25 to 100 ft, speed 75 knots.
 - (g) Order of landing:
 1. Acft number 256—CC, and Helicopter Site White.
 2. Acft number 273—RP, Helicopter Site Blue and Helicopter

Site Yellow.

- (h) Station time, 1245; Takeoff, 1255; LAND, 1325.
- (5) LZ operational NLT 1335.
- (6) Loading area: 891817.
- (7) Aircraft ready for loading: 1200.
- (8) Landing requirements for aircraft: 50-meter circle.

(Classification)

(9) Two serials of four flights each, with eight UH-1D's per flight and a time interval of 1 minute between flights and 2 minutes between the serials, will land:

Serial number 7—HAWK ONE—Helicopter Site Yellow
HAWK TWO—Helicopter Site White
HAWK THREE—Helicopter Site Green
HAWK FOUR—Helicopter Site Blue
Serial number 2—CONDOR ONE—Helicopter Site Yellow
CONDOR TWO—Helicopter Site White
CONDOR THREE—Helicopter Site Green
CONDOR FOUR—Helicopter Site Blue

(10) All flights released by pathfinder site commander.

(11) Alternate landing sites.

(a) Blue to White, White to Blue.

(b) Green to Yellow, Yellow to Green.

4. ADMINISTRATION AND LOGISTICS

a. The following equipment will be carried by each party in addition to individual equipment and weapons:

(1) CC: Two AN/PRC-25 radios, one homing beacon, anemometer, necessary batteries, three green and two red smoke grenades, and five VS-17 panels.

(2) RP: Four green and two red smoke grenades, five VS-17 panels, one homing beacon, and two AN/PRC-25 radios with batteries.

(3) Helicopter Site: (Each) six VS-17 panels, two AN/PRC-25 radios with batteries, four smoke grenades (color code of site), and two red smoke grenades.

(4) One assault ration per man.

(5) Ammunition.

(a) M14—120 rounds.

(b) M79— $\frac{1}{2}$ basic load.

(c) .45 cal. pistol—three magazines per weapon.

(d) Frag grenades—two per man.

(6) On-call equipment will be loaded on $\frac{3}{4}$ -ton truck prepared for delivery by CH-37. Following equipment prepared for on-call delivery to helicopter landing zone: two pathfinder signal lights, 16 baton flashlights, 12 each blue, green, yellow, and white lanterns (MX 290's), 8 red lanterns, 9 white lanterns (RP), and extra batteries. One $\frac{1}{4}$ -ton truck w/radio, one $\frac{1}{4}$ -ton trailer w/660 rounds M14 rifle ammunition, four each blue, yellow, and white smoke grenades, 11 green smoke grenades, and 12 red smoke grenades. Individual equipment not carried will be loaded in $\frac{3}{4}$ -ton trailer with three cases of C-rations.

(7) Wounded will be evacuated on aircraft returning to base when available. In all other cases, request for medical evacuation will go through CC. Wounded will be evacuated prior to PW's. The supported unit will provide guards for all PW's being evacuated to base.

5. COMMAND AND SIGNAL

a. Signal.

(1) Annex H to 10th Inf Div SOI in effect.

(Classification)

(Classification)

(2) Radio listening silence in objective areas. Aircraft calls from CP on all except internal net. Flight leaders will initiate communication with landing sites.

(3) Code letter "A" displayed at RP.

(4) Yellow smoke at RP on call.

(5) Helicopter sites display smoke on-call only.

(6) SOP emergency visual signals in effect.

(7) Call signs.

(a) Control center: AJAX.

(b) Aircraft: HAWK—serial one, CONDOR—serial two.

(c) Abn relay: HANGMAN.

(d) RP and helicopter sites use call signs corresponding to assigned colors and duty.

(8) Frequencies.

(a) Ground-to-air.

1. Landing Site Green: Primary: 42.3, Alternate: 44.5

2. Landing Site White: Primary: 41.2, Alternate: 45.1

3. Landing Site Blue: Primary: 40.0, Alternate: 43.5

4. Landing Site Yellow: Primary: 45.9, Alternate: 46.7

(b) Pathfinder internal net.

1. Primary: 39.0 mc.

2. Alternate: 39.5 mc.

(9) Two orange VS-17 panels vertically displayed to mark assembly points.

(10) Mark obstacles with red VS-17 panels.

(11) Pathfinder radio net for operation of landing zone has priority over tactical use of net.

b. Command.

(1) Senior pathfinder in each party will remain in command until we reorganize on my order.

(2) Co A's initial CP will be at coordinate 077846.

(3) Co B's initial CP will be at coordinate 055863.

SMITH

Capt

Commanding

Annex A—Operation planning form.

(Classification)

APPENDIX V

AERIAL NAVIGATION STRIP MAPS

1. General

Aerial navigation strip maps can be used as map substitutes and as a systematic method for the planning and study of flight routes. A sample strip map is shown in figure 12.

2. Essential Elements of Aerial Navigation Strip Maps

All aerial navigation strip maps should contain the following eight elements:

- a.* Checkpoint number.
- b.* Identification of checkpoint.
- c.* Sketch.
- d.* Distance to checkpoint from start point or last turning point.
- e.* Magnetic heading.
- f.* Flight speed.
- g.* Altitude (indicated).
- h.* Time (from start point).

3. Preparation

In preparing aerial navigation strip maps, consideration must be given to the following factors:

- a.* Checkpoints should be 10 to 15 minutes apart and easily recognizable from the air.
- b.* A turning point should be a major checkpoint.
- c.* One minute should be added for turns greater than 90° or for gain or loss of altitude at turns 90° or less.

4. Formulas

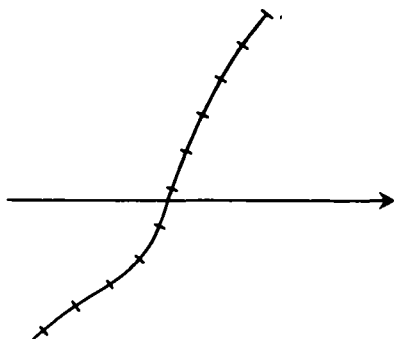
The formulas used in computing time and distance are as follows:

$$\begin{aligned} a. \text{ Time (T)} &= \frac{\left[\begin{array}{l} \text{Distance in nautical} \\ \text{miles (D)} \times 60 \end{array} \right]}{\text{Speed in knots (R)}} \\ b. \text{ Distance in nautical miles (D)} &= \frac{\text{Speed in knots (R)} \times \text{Time (T)}}{60} \end{aligned}$$

AERIAL NAVIGATION STRIP MAP

CHECK POINT #1

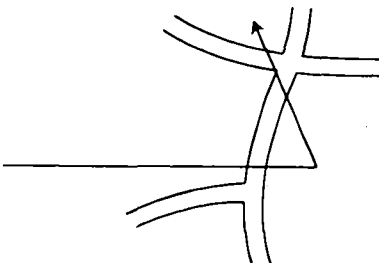
CROSS RAILROAD



1 nautical mile out
from Lawson Field,
306 magnetic heading,
flight speed 70 knots,
altitude 3000' MSL,
.9 minutes from Lawson

CHECK POINT #2

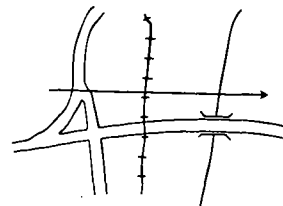
TURN POINT #1
CRAWFORD, ALABAMA



12 nautical miles out
from Lawson Field,
306 magnetic heading,
flight speed 70 knots,
altitude 3000' MSL,
10.3 minutes from Lawson

CHECK POINT #3

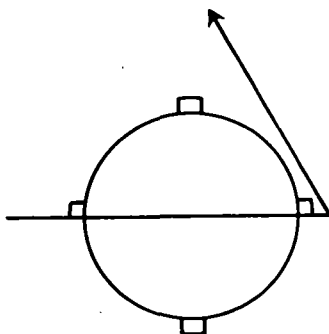
PITTSVIEW, ALABAMA



15.8 nautical miles out
from turn point #1,
174 magnetic heading,
flight speed 85 knots,
altitude 2000' MSL,
22.5 minutes from Lawson

CHECK POINT #4

TURN POINT #2
WEEDON AIRPORT



30 nautical miles out
from turn point #1,
174 magnetic heading,
flight speed 85 knots,
altitude 2000' MSL,
32.5 minutes from Lawson

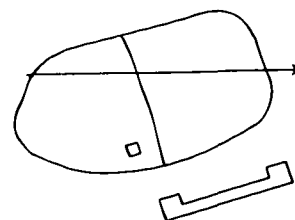
CHECK POINT #5

CROSS RIVER



19 nautical miles out
from turn point #2,
027 magnetic heading,
flight speed 100 knots,
altitude 1000' MSL,
44.9 minutes from Lawson

FRYAR DZ



21 nautical miles out
from turn point #2,
027 magnetic heading,
flight speed 100 knots,
altitude 1000' MSL,
46.1 minutes from Lawson

Figure 12. Aerial navigation strip map.

GLOSSARY

Communication checkpoint—A predesignated point on the flight route from which the aviation element initiates communication with the pathfinder detachment in the landing and/or drop zone.

Cross loading—

a. A system of loading troops so they may be disembarked or dropped at two or more landing or drop zones thereby achieving unit integrity upon delivery.

b. A system of loading a unit in two or more aircraft so key personnel, communications equipment, and weapons are split up so the loss of one aircraft will not prevent the completion of the mission.

Homing beacon—An electronic device used to assist in the guidance of aircraft. It may be a transmitter controlled by an operator on the ground or a transceiver which can be activated electronically by the aviator.

Intercept azimuth—An azimuth flown by aircraft from the RP to an intercept point that will allow the formation to be visually intercepted. This technique is only employed when a direct azimuth from the RP would require the formation to make sharp turns after the landing site is located.

Landing point—A designated touchdown point on the ground for landing aircraft.

Landing site—An area containing one or more landing points.

Landing zone—A general area or region encompassing one or more landing sites and necessary control installations.

Light beacon—A light-transmitting device (incandescent or infrared) used to assist in the guidance of aircraft, assembly of ground units, or both.

Pathfinder control center (CC)—The communication and operation center from which pathfinders provide navigational assistance for aircraft enroute to a drop or landing zone and maintain control of all aircraft within the zone.

Pathfinder detachment—Army TOE pathfinder organization.

Pathfinders—Individuals who precede or accompany the assault echelon of an Army unit engaged in an air-landed or air-delivered operation to establish and operate navigational aids in the objective area for the transporting aircraft.

Release point—A manned traffic control point and final navigational checkpoint at which pathfinders employ visual and electronic aids to assist aircraft approaching the objective area.

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For explanation of abbreviations used, see AR 320-50.









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FM 57-38—PATHFINDER OPERATIONS—1966